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COMPUTER PROGRAMS FOR CALCULATING TWO-DIMENSIONAL POTENTIAL FLOW IN AND ABOUT PROPULSION SYSTEM INLETS

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INTRODUCTION

Proposed V/STOL aircraft require propulsion systems that operate efficiently over wide ranges of free-stream velocity, incidence angle and inlet throat Mach number (mass flow rate). A major component determining the efficiency of operation at these flow conditions is the inlet. An important tool in the design of an efficient inlet is the capability to theoretically analyze the inlet flow.

Many of the proposed V/STOL inlets are three-dimensional (fig. 1). Since the capability for a full three-dimensional inlet analysis does not exist at this time, simpler but approximate methods for modeling these inlets were developed. The flow about some of these inlet shapes (e.g., fig. 1(a)) can be approximated by calculating the flow about a group of axi-symmetric geometries having shroud profiles corresponding to several circumferential angles. Methods for analyzing axisymmetric geometries exist (ref. 1) and are in use at the Lewis Research Center. However, inlets such as shown in figures 1(b) and (c) are not adequately approximated axi-symmetrically. These inlets are better approximated by two-dimensional geometries. Therefore, a procedure for calculating two-dimensional potential flows was developed. Figure 2 shows the two-dimensional approximations made for analyzing the three-dimensional inlets shown in figures 1(b) and (c).

The procedure developed utilizes three computer programs and is similar to the procedure for calculating axisymmetric flows (ref. 1). The chief program is the Douglas two-dimensional potential flow program (ref. 2) called 23Y at Lewis, which calculates the incompressible potential flow about arbitrary two-dimensional bodies. The other two programs, original with Lewis are called SCIRCL (ref. 1) and COMBIN-2D. Program SCIRCL generates input for 23Y from various specified analytical shapes or sets of coordinate points for the inlet components. Program COMBIN-2D takes the basic solutions output by 23Y and combines them into solutions of interest, and if desired applies a compressibility correction. Figure 3 is a schematic representation of these solution steps.

This paper consists of a statement of the problem to be solved, a description of each of the programs, sample results and sufficient documentation, including a test case, to enable the user to run the programs.

SYMBOLS

A, B, C, D	combination coefficients
M	Mach number
V	velocity
$\dot{W}$	inlet mass flow
α	inlet incidence angle

Subscripts:

c	control station
i	incompressible
S1	passage between lower shroud and centerbody
S2	passage between upper shroud and centerbody
∞	free stream value

PROBLEM AND SOLUTION DESCRIPTION

Statement of the Problem

The basic problem to be solved is to calculate either the compressible or incompressible potential flow in and about an arbitrary two-dimensional inlet at any combination of operating conditions of free stream velocity V_∞, inlet incidence angle α, and inlet mass flow rates $\dot{W}_c$, $\dot{W}_{S1}$, or $\dot{W}_{S2}$. Figure 4 shows four possible combinations of inlet geometries and weight flow specifications to be analyzed. Figure 4(a) shows the single inlet passage where the free stream conditions V_∞, α, and inlet weight flow rate,

$\dot{W}_c$ are specified. Figure 4(b) shows a single inlet with dual passages where V_∞, α, and the two passage weight flow rates $\dot{W}_{S1}$ and $\dot{W}_{S2}$ are specified. Figure 4(c) shows the same inlet and free stream flow conditions, V_∞, α, as figure 4(b). However, in this case the total inlet and one passage weight flow rate, $\dot{W}_c$ and $\dot{W}_{S1}$ are specified. Figure 4(d) shows a dual inlet configuration where V_∞, α, $\dot{W}_{S1}$, and $\dot{W}_{S2}$ are specified. The two dimensional flow problem is solved in several steps (programs).

1. Geometric representation (Program SCIRCL)
2. Incompressible potential flow basic solutions (Program 23Y)
3. Combined solutions with compressibility correction (Program COMBIN-2D).

Each step and its corresponding program is described in the following section.

Description of Solution Steps and Programs

Geometric representation - Program SCIRCL. - The inlet is assumed to be two-dimensional. The body profiles are broken into segments at convenient tangential points (fig. 5). Each segment may be defined by an analytic expression or by a set of points. The inlet duct walls and outer surfaces must be extended far downstream (fig. 5) to facilitate obtaining accurate potential flow solutions in the inlet in the region of interest. The geometry program SCIRCL prepares coordinate-point input for efficient use of the potential flow program and also prints out information such as curvature, wall angles, etc., which is useful in preliminary screening of proposed inlet shapes.

In addition to the surface points, sets of points perpendicular to the inlet axis, called rakes, are needed at axial locations where velocity profiles or streamlines are desired. At least one set of rake points is required, corresponding to the axial location where the inlet weight flow is specified, as discussed with regard to figure 4. Such rakes are called control stations.

Program SCIRCL generates the coordinates of the rake points for 23Y. Program SCIRCL will also produce a Calcomp plot of the inlet geometry and rake points.

Incompressible potential flow basic solutions - Program 23Y. - Program 23Y is the Douglas incompressible potential flow computer program for single or multiple two-dimensional bodies. Briefly, the program utilizes a distribution of sources and sinks of initially unknown strength to represent the inlet profile. The continuous distribution is approximated by representing the inlet as a finite number of discrete flat elements having constant source strength and characterized by the mid point of the element (called the control point). This approximation results in a set of linear algebraic equations for source strength at the control points that are solved by matrix methods. Velocities at the control points and at specified off-body points (rake points) are then calculated from the source/sink distribution.

In the two passage case, the program is used to obtain five basic solutions which are used in linear combination in order to satisfy the prescribed operating conditions (fig. 4). The first basic solution is axial flow, the second is a 90° cross flow, the third, fourth, and fifth solutions are vorticity solutions about the lower shroud, centerbody, and upper shroud, respectively. In the single passage case, only four solutions are generated. The first two are the same as the two-passage case while the third and fourth are vorticity solutions about the lower and upper shrouds respectively.

Combined solution - Program COMBIN-2D. - This program combines the basic solutions $\overline{V}_j$, j=1,2,3,4,5 from 23Y into any number of solutions of interest. A solution of interest is one having specific values of free stream velocity, V_∞, angle of attack of inlet, α, and weight flow, $\dot{W}$, through the control stations described previously. Optional inputs for $\dot{W}$ are average axial velocity at the control stations (V_c, V_{S1}, or V_{S2}) or average Mach numbers (M_c, M_{S1} or M_{S2}). If either $\dot{W}$ or M_c are specified, they are converted to velocities for use in the combination solutions. Temperature and pressure must also be specified if other than standard conditions are used.

The method of combination of the basic solutions is shown in figure 6. A compressibility correction, if desired, is then applied to the velocities. The compressibility correction used is that of Lieblein-Stockman (ref. 3).

$$V_{com} = V_{inc}\left(\frac{\rho_t}{\rho_s}\right)^{V_{inc}/\bar{V}_{inc}}$$

where the terms on the right hand side are obtained from the incompressible solution. This correction requires no alteration of the inlet geometry and can handle locally sonic or supersonic flows. Flow properties (Mach number, pressure ratio, etc.) are calculated for either the compressible or incompressible cases depending on the version desired. The compressibility correction is actuated by setting ICOMP1 to 0. The incompressible version is generated by setting ICOMP1 to 1. If two passages are specified, two of the rakes mentioned under SCIRCL are used as control stations by COMBIN-2D. A control station is the rake where the average inlet axial velocity of the combined solution is specified. The possible choices of control stations for two passage cases are shown in figures 4(b) to (d). If only one passage is specified (fig. 4(a)), then any rake can be used as a control station. However, it should be noted that the compressible solution is most accurate in the vicinity of the control station since the compressibility correction does not exactly satisfy continuity.

When the velocity on the inlet surface becomes locally supersonic, the agreement between theory and experiment is generally not as good as when the flow remains subsonic. To improve the agreement, an optional supersonic correction has been incorporated into the program. The supersonic correction is actuated by specifying NX as 1 on input.

Sample Results

To illustrate the results of the present calculation procedure, the graphic output for the Test Case is presented next.

The graphic output of SCIRCL is illustrated in figure 7 and consists of a plot of the inlet geometry and the computational point spacing, and the location of the rakes and their point spacing. In addition to its reference value the plot is useful for troubleshooting for mistakes in the geometry input and for validating the satisfactory distribution of body points and rake points.

The graphic output of COMBIN-2D is illustrated in figures 8 to 10. Figure 8 shows the pressure distribution on both the internal and external surfaces of the upper shroud. Similar plots can be obtained for the lower shroud and for the centerbody when there is one.

Figure 9 shows the surface Mach number distribution. The comments made above for the pressure plots apply also to Mach number plots.

Figure 10 shows a plot of the flow field vectors. Whenever rake points are specified (see fig. 7) velocity vectors are calculated and can be plotted. Note that velocity vectors can be obtained outside the inlet as well as inside.

INPUT AND OUTPUT FORMAT

SCIRCL Input

Card no.	Format	Col. no.	FORTRAN name	Description
	9A6	1-54	ARE	= title for area plots. "CROSS-SECTIONAL AREA, SQ. IN."
	9A6	1-54	EX	= title for x-axis. "AXIAL POSITION, IN."
	9A6	1-54	CURVO	= title for curvature plots. "CURVATURE ON SHROUD"
	9A6	1-54	SURFAC	= title for x-axis with surface distance plots. "DISTANCE ALONG SURFACE FROM DOWN-STREAM END OF SHROUD, IN."

These first four cards above will be unchanged for all runs and can be made a part of the execution setup deck, or replaced with data statements.

Card	Format	Column	FORTRAN name	Description
1	9A6	1-54	TITLE	Description of Case

FOR CALCOMP PLOTTING OF INLET PICTURES

Card	Format	Column	FORTRAN name	Description
2	6F10.2	1-10	XX	Length, in plot-inches, of X-axis required.
		11-20	XMIN	Value, in data-inches, of far left X-point.
		21-30	EXEP	Data-inch per plot-inch along X-axis.
		31-40	YY	Length, in plot-inches, of Y-axis required.
		41-50	YMIN	Value, in data-inches, of bottom Y-point.
		51-60	ORD	Data-inch per plot-inch along Y-axis (usually equal to EXEP).

FOR INFORMATION USED BY SCIRCL

Card	Format	Column	FORTRAN name	Description
3	-	-	-	Blank
4	2A6, I4, 2I1, 2I2, 10X, I1,	1-6	IDENT	Six-character tag for case I.D.
	9X, 3I1, 2I2	7-12	PROG	23Y
		13-16	NO6	0
	(Flag 'A')	17	LPNCHO	1, Do not save output for 23Y on Unit 17.

Card	Format	Column	FORTRAN	Description
	Flag B	18	IPLOTA	Plot inlet area against X-position (used only for axisym-metric case).
	Flag C	19-20	IPLOTC	-1, Plot curvature versus X +1, Plot curvature versus S (Used only for axisymmetric case)
	Flag D	21-22	IREAD	0 (Obsolete)
ALL FLAGS are 'on' when =1, unless other-wise noted. (Either E or J or neither can be on but not both).				
	Flag J	33	IAB	Redo geometry from point (XAA, YAA) to (XBB, YBB).
	Flag E	43	IREDON(1)	Redo entire geometry via direct interpolation
	Flag F	44	IREDON(2)	LPNCHO for any redo
	Flag G	45	IREDON(3)	IPLOTA for any redo
	Flag H	46-47	IREDON(4)	IPLOTC for any redo
	Flag I	48-49	IREDON(5)	IREAD for any redo
Skip card 5 if J=0				
5	4F12.5	1-12	XAA	X position of starting point for partial redo.
		13-24	YAA	Y position of starting point for partial redo.
		25-36	XBB	X position of ending point for partial redo.
		37-48	YBB	Y position of ending point for partial redo.

Card	Format	Column	FORTRAN	Description
6	4F10.2	1-10	ANBDYS	Number of bodies
		11-20	DELS	Spacing between points in region of interest.
		21-30	DELSMX	Maximum spacing far from region of interest.
		31-40	XRI	Axial distance at which surface distance equals zero.
7	I4	1-4	NRAKE	Number of axial locations at which data across the passage is desired. (Cannot be greater than 25).
8	3F8.5,I3	1-8	XRAK	Axial location of rake.
		9-16	YLO	Y value of first point (lowest point) on rake at XRAK.
(Note: There is one card for each rake)				
		17-24	YHI	Y value of last point (highest point) on rake at XRAK.
		25-27	NY	Number of points in rake at XRAK: Restriction NY $\leq$ 200. Rake points are equally spaced, ΔY, between YHI and YLO where $\Delta Y = \frac{YHI - YLO}{(NY - 1)}$
9	3F10.2	1-10	TYPBDY	Body number. However, if the inlet is symmetrical, then any body can be input as a mirror image of any other body. That can be accomplished by setting TYPBDY = -M.N where M is the number of the body to be created and N is the number of the body to be copied. ANSEG is set to the Y value of the line about which body N is to be mirrored. No other input is required for this body.

Card	Format	Column	FORTRAN	Description
		11-20	ANSEG	= Number of segments for the particular body, except as stated in TYPBDY.
		21-30	DELNEW	= -1., Delta S spacing is set to original value of DELS. = 0., Delta S is set to value of DELS from previous body. = + number, Delta S is set to value of input DELNEW.
10	3F10.2	1-10	ENREED	Code indicating type of curve to be fitted through given points. = 0., for bisuperellipses. See Table I and figure 11 for available options. Input 4, 5, or 6 (XIN, YIN) points as directed. = 1000. Same as = 0 but with finer point spacing near one end of segment (two such segments required). Usually used to give finer spacing at the highlight. The superellipse going into the highlight and the one coming out should have this flag. For bisuperellipses where the '1000.' option is to be used, the rate at which the point spacing, ds, changes near one end $dS_i = dS_{i-1} - (\text{Rate})(dS_{i-1})$ can be specified on input.

Card	Format	Column	FORTRAN	Description
				The rate (program name = PACE) is entered as the fractional part of ENREED for each such segment. For example, if ENREED were input as 1000.06, the spacing for consecutive points would be evaluated as follows:
				$DS_i = DS_{i-1} - (0.06)\,DS_{i-1}$
				if segment is to go from large-to-small spacing, or:
				$DS_i = DS_{i-1} + 1.5\,(0.06)\,DS_{i-1}$ if segment is going from small-to-large spacing.
				If PACE is entered as zero (i.e., ENREED = 1000.), the default value, 0.05, is used.
				(PACE $\leq$ 0.133)
				*The first '1000' superellipse ON A BODY reduces the point spacing as far as possible, down to a limit of 2 percent of the ds value at the beginning of the segment.
				*All subsequent '1000' superellipses input will increase ds as far as possible up to the input value of DELS.
				*Any number or types of segments may be input between the first and subsequent '1000' bisuperellipses, with the exception of a normal bisuperellipse (ENREED=0).

Card	Format	Column	FORTRAN	Description
				= 1, is a straight line, input 2 co-ordinates (XIN(1), YIN(1), XIN(2), YIN(2)) (fig. 12).
				The first and last straight lines on bodies 2 and 3 and the last straight line on body 1 will automatically have their spacing increased from approximately DELS near the region of interest to approximately DELSMX away from the region of interest. To get this type of spacing in the first straight line of body 1, ENREED must be specified as 10..
				The first straight segment of a body must be equal in axial length to the last straight segment on the previous body. (If the actual straight lines are not equal in length, the longer should be input as two segments).
				= 10., special straight line used for initial straight line on lower shroud. The straight line starts with large spacing (DELSMX) and ends with small spacing (DELS), (fig. 12).
				= -1., fits a lemniscate between a straight line and a point. Input is three coordinates (fig. 12).
				= -3., fits a cubic between two straight lines. Input 4 coordinates (fig. 12).

Card	Format	Column	FORTRAN	Description
				= -4.0, generates a segment which is a mirrored image of all the points from (XIN(1), YIN(1)) to (XIN(2), YIN(2)) about the line Y = YIN(3). See cards 11 and 12 for XIN and YIN formats.
				= 99., for direct interpolation option over one segment (see input instructions for card 12).
		11-20	REEDEN(1)	(See table I). Input exponent of x-term for bisuperellipse equation. Blank for all other segment types.
		21-30	REEDEN(2)	(See table I). Input exponent for y-term of bisuperellipse.
11	6F12.5	1-72	XIN(I) I=1,2,3,6,4,5	X-coordinate for specified points.
12	6F12.5	1-72	YIN(I) I=1,2,3,6,4,5	Y-coordinate for specified points. Note: If ENREED = 99. instead of cards 11 and 12, input the following cards.

Card	Format	Column	FORTRAN	Description
11a	Namelist/$BODYIN/		Z(I)	Z is a complex array containing the X value (in the real part) and Y value (imaginary part) of each given point along the segment. The namelist will normally be longer than one card.
12a	Namelist/$AUXIN/		DONE	= A logical variable which should be input as = .TRUE. Note: If ANSEG=0 and TYPBDY $\neq$ 0, skip card No. 10, and substitute 11a for 11 and 12a for 12.

Input Deck Structure

Card	
1	
2	
3	
4	
5	(only if flag J > 0)
6	
7	
8	
.	
.	Number of '8' cards = NRAKES
.	
8	
9	Number of '9' cards = ANBDYS
10	
11	
12	Number of '10-11-12' groups for each '9' card = ANSEG
.	*If ENREED = 99 on card 10, use 11a and 12a instead of 11 and 12
.	*If ANSEG = 0 and TYPBDY ≠ 0 on card 9, skip 10 and substitute 11a and 12a for 11 and 12
.	
10	
11	
12	Figure 13 shows an SCIRCL input form, reflecting the above instructions.

SCIRCL Output

Printed Output

Input file dump (a list of input cards)

Case number and title

Input card 3

Input card 4 (case I. D. and SCIRCL flags)

Input card 6 (number of bodies, DELS, DELSMX, and XRI)

Total number of points for all bodies should not exceed 500.

Total for any one segment of a body should not exceed 200.

An error message will indicate if these limits have been exceeded.

Total number of off-body points must not exceed 200.

Body 1 segment data (actually lower shroud data for two-dimensional case), body 2 segment data (centerbody data for two-dimensional case), and body 3 segment data. For each segment:

ENREED (as input) and type of segment

Data depending on type of segment.

Straight Line

X	X(1)	X(2)
Y	Y(1)	Y(2)

Last point data*

Bisuperellipse

Exponents

P as read in	X	X(1)	X(2)	X(3)	X(6)	X(4)	X(5)	
Q as read in	Y	Y(1)	Y(2)	Y(3)	Y(6)	Y(4)	Y(5)	
P as used	A	XO						
Q as used	B	YO	OMEGA					

where A and B = Semimajor and minor axes of transformed superellipse

XO and YO = Center of the transformed superellipse

OMEGA = The difference (in radians) between the slopes of the end point slope lines minus $\pi/2$ (i.e., OMEGA is a measure of the nonperpendicularity of the slope lines).

Number of iterations**

Iteration data***

Last data point*

'Magic triangle' messages refer to the triangle formed by extending the superellipses slope lines toward each other and drawing a chordline between input points number (X2, Y2) and (X4, Y4). Input points (X3, Y3) and (X6, Y6) must lie within this triangle, or, for certain special cases, may lie in a similar triangle on the opposite side of the chordline.

If input points (X3, Y3) and/or (X6, Y6) fall outside the magic triangle, the following message (or messages) is/are printed:

"This point is below the magic triangle ..."

"This point is outside the magic triangle..."

Cubic

X	X(1)	X(2)	X(3)	X(4)
Y	Y(1)	Y(2)	Y(3)	Y(4)
A	B	C	D	

where A, B, C, D are the coefficients of the cubic equation.

Number of iterations**

Iteration data***

Last point data*

Lemniscate

X	X(1)	X(2)	X(3)
Y	Y(1)	Y(2)	Y(3)
THETMX		CALC	ACALC

where THETMX CALC = angle between line 1 - 3 and line 1 - 2.
ACALC from equation $R^2 = 2(ACALC)^2 \sin 2\theta$ where

$$\theta = \text{THETMX} \text{ and } R^2 = [XIN(3) - XIN(2)]^2 + [YIN(3) - YIN(2)]^2$$

Number of iterations**

Iteration data***

Last point data*

*Last point data. This is the coordinate point data for the last point of the segment. It is presented here because it is overwritten by the first point of the following segment and therefore does not appear in the point-by-point array below.

**Number of iterations is the number of iterations required to achieve a satisfactory point spacing for 23Y and have the calculated last point of the segment coincide with the input endpoint (to within a prescribed tolerance of 0.1 DELS). If this satisfactory spacing and end point matching is not achieved within 150 iterations, the following message is printed out above the number of iterations:

"This set of data exceeded 150 iterations. Calculations stopped XBRK YBRK.

X(1), Y(1), X(2), Y(2), X(3), Y(3), X(4), Y(4), X(5), Y(5)."

***Iteration data

DELS IN	Value of ds at end of previous segment
DELS	Value used to start final iteration for this segment
DELS OUT	Value of ds at end of this segment, to be passed on to the next segment
DSTEST	Distance from last calculated point to input segment endpoint
FINAL PACE	The value of PACE at the conclusion (or termination) of the point-spacing iteration for bisuperellipses with ENREED 1000

INPUT FOR THE 2D-COMBINATION PROGRAM

For three body case

NT(1) = , NT(2) = , NT(3) = , NHUBMX = , NSPLMX = NP =

For two body case

NT(1) = , NT(2) = , NHUBMX = , NP =

(See 2D-COMBIN input section)

Body coordinates (a separate set for each body)

Point number

X-axial distance

Y-radial distance

KAPPA-curvature

DY/DX-slope

ALPHA-slope angle in degrees

S-surface distance measured from first point of each body

S- S(2) - surface distance measured from XRI

DELTAS-distance between points

Rake Information

XRAK - axial location of rake

YLO - Y value of first location on rake

YHI - Y value of last location on rake

NDY - number of Y points on the rake, as input

File output. - The file output (UNIT 17), written by SCIRCL, is used directly as input to 23Y. The file is primarily in 6E13. 8 format, consisting of the on-body point coordinates and rake points.

Graphic output. - Standard Calcomp can be produced for each geometry run as follows:

(1) For all cases: an X - Y 'picture' of the inlet with SCIRCL-generated on-body points denoted by the '+' symbol and connected with straight lines; segment end points have a large octagonal symbol; off-body rake points are denoted by a small square symbol (see fig. 7).

(2) For cases with IPLOTC $\neq 0$ (used only for axisymmetric cases): a graph of upper shroud body curvature against axial position (IPLOTC = -1) or against distance along shroud (IPLOTC = +1).

COMBIN-2D Input

English engineering units are used throughout the program.

Length, in.
Velocities, ft/sec
Angles, deg
Pressure, lb/ft^2
Temperatures, ^oR
Densities, $slug/ft^3$
Force, lb
Weight flow, lb/sec

Card	Format	Column	FORTRAN Name	Description
1	3A6	1-18	TITLE	Title card
2	9I4	1-4	NT	Total number of on-body points (for three body input NT(3). For two body input NT(2).)
		5-8	NS1	Number of on-body points on the lower shroud (NHUBMX from SCIRCL).
		9-12	NH	Number of on-body points on the lower shroud plus hub (for three bodies, NSPLMX from SCIRCL-- For two bodies, NHUBMX from SCIRCL).
		13-16	NP	Total number of off-body points (NP from SCIRCL).
		17-20	IW	Flag for type of input through the control station: = 0, weight flow = 1, Mach number = 2, velocity
		21-24	NX	= 1, apply supersonic velocity correction to data

Card	Format	Column	FORTRAN Name	Description
		25-28	KND	Flag for scaling variables. All input lengths are divided by ELND. If KND = -1, ELND = YCU = 0, ELND = 1 = 1, ELND = YCU - YCL = 2, ELND = the read-in value from card 4.
		29-32	ICOMP1	Type of solution to be computed: = 0, compressible = 1, incompressible
		33-36	IHUB	IHUB = 0, no hub input $\neq$ 0, three body input
3	10F8.0	1-8	VC	Average axial velocity at the control station between lower and upper shrouds upstream of the centerbody
		9-16	VS1	Average axial velocity at the control station between the centerbody and lower shroud
		17-24	VS2	Average axial velocity at the control station between the centerbody and upper shroud. Note if IW=2, then two of the three velocities must be input for the two passage case
		25-32	VINF	Free stream velocity
		33-40	ALFA	Angle between free stream velocity and X-axis of the inlet
		41-48	MC	Average Mach number at the control station between lower and upper shrouds
		49-56	MC1	Average Mach number at the control station between the centerbody and lower shroud

Card	Format	Column	FORTRAN Name	Description
		57-64	MC2	Average Mach number at the control section between the centerbody and upper shroud. If IW=1 then two of the three Mach numbers must be input for the two passage case
		65-72	TTOTAL	Total temperature. If TTOTAL = TSTAT=0, then TTOTAL = 518.67 will be used.
		73-80	PT	Total pressure. If PT=0.0 and PSTAT≠0.0, the program will calculate PT. If PT = 0.0 and PSTAT=0.0, PT is set to 2116.
4	10F8.0	1-8	ELND	ELND is the arbitrary length used for scaling or normalizing. Refer to KND input.
		9-16	WDOTC	Weight flow at the control station between the upper and lower shrouds
		17-24	WDOTC1	Weight flow at the control station between the centerbody and lower shroud
		25-32	WDOTC2	Weight flow at the control station between the centerbody and upper shroud. If IW=0, then two of the three weight flows must be input for the two passage case.
		33-40	PSTAT	Static pressure
		41-48	TSTAT	Static temperature. If PSTAT and TSTAT are not 0.0, total temperature and total pressure will be calculated using PSTAT and TSTAT.
		49-56	CUTOF1	If CUTOF1 ≠ 0, then the pressure ratio P_S/P_T on the lower shroud will be plotted against a dimensionless surface distance S/CUTOF1 starting at X = XR1 for a distance of S = CUTOF1.

Card	Format	Column	FORTRAN Name	Description
		57-64	CUTOF2	Same as CUTOF1 except for upper shroud
		65-72	CUTOFH	Same as CUTOF1 except for the hub.
		73-80	VPERIN	If VPERIN is greater than zero then a CALCOMP plot of the inlet showing rake point flow field data will be produced. VPERIN is the value of a unit vector in ft/sec/in.. If VPERIN not equal to zero, card "5" must be input.
4A	6F10.0	1-10	XX	The length in plot inches of the abscissa of the velocity plot.
		11-20	XMIN	Value, in data inches, of far left X-point.
		21-30	EXEP	Data inch per plot inch along X-axis.
		31-40	YY	Length, in plot inches, of the ordinate.
		41-50	YMIN	Value, in data-inches, of bottom Y point.
		51-60	ORD	Data inch per plot inch along Y-axis.
5	3F10.0	1-10	XTEST	Axial location of the control station upstream of the centerbody between lower and upper shrouds
		11-20	YCL	Y on the lower shroud at XTEST
		21-30	YCU	Y on the upper shroud at XTEST
6	3F10.0	1-10	XTEST1	Axial location of the control station between the centerbody and lower shroud
		11-20	YCL1	Y on the lower shroud at XTEST1.
		21-30	YCU1	Y on the centerbody at XTEST1.
7	3F10.0	1-10	XTEST2	Axial location of the control station between the centerbody and upper shroud.
		11-20	XCL2	Y on the centerbody at XTEST2.
		21-30	YCU2	Y on the upper shroud at XTEST2.

Note: Cards "6" and "7" are not used for a single-passage case.

Card	Format	Column	FORTRAN Name	Description
8	3F10.0	1-10	XR1	Axial location on the lower shroud where S = 0. (Must be at the highlight).
		11-20	XR2	Axial location on the upper shroud where S = 0. (Must be at the highlight).
		21-30	XRH	Axial location on the hub where S = 0. Leave blank for two body case. (Must be at the highlight).
9	3F10.0	1-10	YR1	Y on the lower shroud at XR1.
		11-20	YR2	Y on the upper shroud at XR2.
		21-30	YRH	Y on the centerbody XRH.

Figure 14 is the input form for COMBIN-2D.

COMBIN-2D Output

Printed Output

Input file dump

TITLE - followed by 2-D COMBINATION SOLUTION

Version of run (i.e., compressible or incompressible)

A list of the basic flow solutions obtained from 23Y

In the table that follows, several functions of four different velocities are given. The velocities are:

Control: VC, average axial velocity at upstream control station

Lower passage: VS1, average axial velocity at control station between hub and lower shroud.

Upper passage: VS2, average axial velocity at control station between hub and upper shroud.

Free stream: V_∞, free stream velocity

The rest of the table is self-explanatory perhaps with the exception of the terms INC and COMP. INC means calculated from the incompressible equations and COMP means calculated from the compressible equations.

The rest of the output will be defined by its name.

ALPHA	Angle of attack of inlet
VINF/VC	V_∞/V_c
VSONIC	Critical velocity uncorrected for compressibility
VSONICC	Critical velocity
WDOTCR	Corrected weight flow at upstream control station $\dfrac{\text{WDOT} \times \sqrt{\text{THET}}}{\text{DEL}}$
WDOTLCR	Corrected weight flow at control station between center-body and lower shroud
WDOTUCR	Corrected weight flow at control station between center-body and upper shroud
TSTAT	Free stream static temperature
PSTAT	Free stream static incompressible pressure
PSTATC	Free stream static compressible pressure
ASTAT	Free stream static speed of sound
RHOSTAT	Free stream static density
WDOTC	Input mass flow at upstream control station
WDOTL	Input mass flow at downstream lower control station
WDOTU	Input mass flow at downstream upper control station
VIC	Incompressible average velocity at upstream control station
VICL	Incompressible average velocity at downstream lower control station
VICU	Incompressible average velocity at downstream upper control station
TTOT	Free stream total temperature

PTOT	Free stream total pressure incompressible
PTOTC	Free stream total pressure compressible
ATOT	Free stream stagnation speed of sound
RHOTOT	Free stream stagnation density
THET	TTOT/518.67
DEL	PTOTC/2116.22
XRI1	Input
YRI1	Input
XRI2	Input
YRI2	Input
XTEST	Input
YCL	Input
YCU	Input
LND	Length used for scaling
XTEST1	Input
YCL1	Input
YCU1	Input
XTEST2	Input
YCL2	Input
YCU2	Input
HUB-TIP L	Lower passage hub to tip ratio
HUB-TIP U	Upper passage hub to tip ratio

P - S CUTOFF L - CUTOF1	Input
P - S CUTOFF HUB - CUTOFH	Input
P - S CUTOFF U - CUTOF2	Input
NT	Input
NP	Input
NS1	Input
NH	Input
KND	Input
IW	Input
NX	Input
ICOMP1	Input
IHUB	Input
V1	Average axial velocity at specified control station for basic solution 1 from 23Y
V2	Same as V1 except for basic 23Y solution 2
V3	Same as V1 except for basic 23Y solution 3
V4	Same as V1 except for basic 23Y solution 4
V5	Same as V1 except for basic 23Y solution 5

23Y basic solutions 1 and 2 are axial and crossflow solutions. For a three body case, solutions 3, 4, and 5 are vorticity solutions about the lower shroud, centerbody, and upper shroud, respectively. For a two body case, solutions 3 and 4 are the vorticity solutions about the lower shroud and upper shroud. Note there is no 5 solution for this case.

A, B, C, D — Coefficients of combination

VINFP — Incompressible free stream velocity "uncorrected" for compressibility if the input value was compressible

OTHER MESSAGES: "VRESON = ________ IS GREATER THAN VMAX. VCONC = ________." The velocity at a certain on-body point exceeds the allowable value for the local expansion condition so that the isentropic ratio term: 1. - VCONC is less than zero. Where,

$$VCONC = \frac{\gamma - 1}{2}\left(\frac{VRESON}{a_{tot}}\right)^2.$$

"I EXCEEDS 20 ITERATIONS FOR RHOBAR. VBAR = _______, VCOMP = _______, RHOBAR = _______. VBAR HAS BEEN REDUCED TO VCOMP * RHOBAR/RHOTOT". Subroutine VBARIT attempts to find the average density at each axial location using the isentropic density ratio, the stagnation density (RHOTOT) and the average incompressible VBAR (based on weight flow and the cross section). It has failed. VCOMP is the 20th attempt at finding the compressible velocity and has been used to compute the RHOBAR that will be returned. The normally unchanged VBAR is adjusted to agree with these abbreviated results.

For NX = +1, supersonic velocity correction is operating and a message to that effect will appear each time a region of local supersonic flow is encountered on the body, and also when it ends. The body point number where these transitions occur will also be printed.

ON-BODY POINTS

Lower shroud, centerbody or upper shroud

For both compressible and incompressible versions,

I	The index number of the point
X	Axial distance
Y	Height
S	Surface distance from XRI

Compressible version

VCOM	Resultant velocity with compressibility correction applied
VBAR	Average incompressible velocity at a given axial location
MACH	Mach number
CP	Compressible pressure coefficient $\left(\frac{p_i - p_o}{q_o}\right)$
RB/RT	$\bar{\rho}_c/\rho_t$
PS/PT	Static to total pressure ratio, $\left[1 - 0.2\left(\frac{V}{a_t}\right)^2\right]^{3.5}$

Incompressible version

VINC	Resultant incompressible velocity
MACH	Mach number (based on incompressible velocity and compressible flow equations)
CP	Incompressible pressure coefficient $\left[1 - \left(\frac{V_i}{V_o}\right)^2\right]$
PS/PT	Static to total pressure ratio, $1.0 - \frac{1/2\,\rho V^2}{P_t}$

OFF-BODY POINTS

For both incompressible and compressible versions:

Rake number

I	Number of the point (points without numbers are interpolated values at a body)
X	Axial location
V	Vertical location
THETA	Flow angle, $\tan^{-1}\left(\frac{VY}{VX}\right)$
MACH	Mach number
WFRACT	Local cumulative weight flow at a given points on a rake divided by total weight flow at the rake

Compressible version

VX	Axial velocity corrected for compressibility
VY	Vertical velocity corrected for compressibility
VRE	Resultant velocity = $\sqrt{VX^2 + VY^2}$
VBL	Average incompressible velocity at given axial location
RB/RT	$\bar{\rho}/\rho_t$
PS/PT	Same as ON-BODY POINTS

Incompressible version

VX	Incompressible axial velocity
VY	Incompressible vertical velocity
VRE	Resultant velocity = $\sqrt{VX^2 + VY^2}$
PS/PT	Same as ON-BODY POINTS

RAKE WEIGHT FLOW DATA

For each rake the following data are given:

I	Number of rake
X	Axial location of rake
IRAK	Parameter to describe location of rake on the inlet = 1; upstream of inlet = 2; on lower shroud of "scoop" inlet upstream of upper shroud = 3; upstream of centerbody between upper and lower shrouds = 4; downstream of centerbody highlight in upper passage = 5; downstream of centerbody highlight in lower passage = 6; outside and below inlet = 7; outside and above inlet
WDOT	Integrated weight flow for rake
WDOTCA	Specific corrected weight flow at each rake
MACH	One-dimensional Mach number at each rake based on WDOTCA

Graphic Output

Standard CALCOMP plots of PS/PT (fig. 8) and Mach number (fig. 9) distribution against S/CUTOF1, S/CUTOF2, or S/CUTOFH are made for any body whose value of cutoff is not zero. Two curves appear on each plot; one curve is the internal distribution and the other is the external distribution.

If VPERIN not equal to zero, then a plot will be made of the velocity flow field at the off-body points (see fig. 10). At each off-body point a vector will be drawn showing flow angularity and magnitude. Magnitude will be shown by relative size of the vectors (a unit vector will have a magnitude of VPERIN).

DESCRIPTION OF SUBROUTINES.

Figure 15 illustrates the calling relations between the main program and their subroutines.

Program SCIRCL

(A) MAIN SCIRCL	Read all input, call required subroutines for each segment as requested, plot each segment after points are generated by subroutine; list points; test for reworking of geometry if required

Straight Lines

(B) STRAIT	Generate points on a general straight line segment
(C) FNSTRH	Generate points on final straight segment of a body
(D) FRSTSH	Generate points on first straight segment of a body

Bisuper Ellipses

(E) TEST	Test superellipse input to see if mirroring about y-axis is required.
(F) PRELPS	Mirror superellipse input data about y-axis so that slope (1,2) is greater than the slope (1,4) (fig. 11(a))
(G) SUPERC	Generates points on a general bisuperellipse (table I)
(H) FONISØ	Iterate on input conditions to find bisuperellipse exponents

Other Curves

(I) CUBIC	Fit a cubic polynomial between two nonvertical parallel lines

(J) SIMQ — Simultaneous solution of equations to obtain coefficients of the cubic polynomial

(K) LEM — Generates points on a general Lemniscate

(L) MIRROR — Mirror the hub points to obtain the shroud

Direct Interpolation

(M) XYCALC — Executive routine for the following modules: purpose is to generate points "correctly" spaced along the curve defined by a list of input points. Inputs are used to develop double 3-point interpolating polynominal in successive regions along the curve. Polynomals are then used to suggest points, derivatives, etc. which can be tested for spacing as defined by standard criterion (see comments in SPGEN listing)

(N) SGEN
(O) DSTRP
(P) SPGEN
(Q) DNTRPC
(R) FNTRP
(S) FSTRP
(T) FNTRPC
(U) FNTRPA
(V) TLU
(W) LIMIT

Refer to listing for comment card description

Special Calculations; Output to 23Y

(X) WPUNCH	Generate rake points at requested positions; plot rakes
(Y) WRTXY	Write all X, Y coordinates
(Z) AREAA	Compute area
	Picture Plotting
(Z1) DRAW	Plot X-Y meridional plane picture of each inlet segment
(Z2) PLOSIS	Plot frames for inlet picture and label axis
	Utility
(Z3) SINTP	Lagrange three-point interpolation
(Z4) SORTXY	Rearrange the values in an array, x, to increase with increasing index (ascending order); sort y accordingly
	System Library
ERTRAN	Routine which gives FORTRAN access to several UNIVAC 1110 operating system commands. Can be eliminated by defining unit 25 before execution
SYMBOL SCALE LINE NUMBER PLOT	Standard CALCOMP routines needed for all plotting.

Program COMBIN-2D

(A) MAIN COMBIN-2D	Executive calls to INPTR, SEARCH, ANGLEF, SOLVE, OFBDY, and if compressibility correction desired COMCOR. Also, this program calls PLTER if output plots are desired
(B) INPTR	Reads input parameters from unit 5. Also reads 23Y output coordinates and basic flow solution velocities.
(C) CONST	Calculates most constants and intermediate parameters and prints results.
(D) SEARCH	Finds the highlight on each body and calculates areas for all on- and off-body (rake) points. These areas are used in the compressibility correction
(E) ANGLEF	Finds the body surface angle for each point on the inlet
(F) SURF	Calculates surface distance along body as a function of X
(G) SOLVE	Computes linear combination coefficients A, B, C, and D to satisfy input flow conditions. Also calculates the incompressible velocities and average velocity $\overline{V}_i$ (used in compressibility correction) for each point
(H) COMCOR	Applies Lieblein-Stockman compressibility correction
(I) ONBODY	Uses velocities and densities to calculate: pressure ratios, Mach number, flow angles and list all results for points on the body

(J) OFBDY — Same as ONBODY for rakes. Also calculates local fractional weight flows for each rake point

(J) VBARIT — Calculates average density ratio for compressibility correction

(L) INTER — See SCIRCL routine SINTP (duplicate)

(M) SORTXY — See SCIRCL routine SORTXY (duplicate)

(N) INTER2 — Calls INTER

(O) INTER3 — Calls INTER

(P) INTEG — Performs trapezoidal integration

(Q) CALTIT — Titles plots of pressure and Mach number versus surface distance

(R) PLTER — Plots pressure and Mach number versus surface distance

INPUT/OUTPUT UNITS

SCIRCL

- 5 - Standard card input
- 6 - Standard output list
- 4 - Temporary storage; if flag J or E is 1, input to direct interpolation routines is written here
- 17 - Saved. If flag A is 0, input for 23Y consisting of X, Y points is written here (6E13. 8)

23Y

- 5 - Input (= 17 from SCIRCL)
- 6 - Standard output list
- 7 - Saved. Input for COMBIN-2D is written here (6 E 13. 8) X, Y, V1, V2, V3, etc.
- 2-4, 8-18 } Temporary storage

COMBIN-2D

5 - Standard card input, flow conditions, etc.

6 - Standard output list

7 - Input from 23Y

12 - Saved. Input data (for lower shroud) for boundary layer program

13 - Saved. Input data (for upper shroud) for boundary layer program

14 - Temporary storage

LISTING OF PROGRAMS.

ORIGINAL PAGE IS
OF POOR QUALITY

PROGRAM SCIRL

```
C     PREPARE INPUT DATA FOR DOUGLAS POTENTIAL FLOW PROGRAMS EOD AND 23YA   0000
C                                                                      A   0010
C          SECOND VERSION  -  SPACING SPECIFIED                        A   0020
C                                                                      A   0030
      DIMENSION REEDEN(2),ARE(9),EX(9),CURVO(9),SURFAC(9)              A   0040
      DIMENSION CAPPER(200),DIST(200),KAY(9),TYP(9),IREDON(4)
      DIMENSION SD(500), S(500), NY(25)                                A   0060
      COMMON /SPREP/ KPREP,NIN                                         A   0070
      COMMON /MNSD/ NNSD,NSDBDY(10)                                    A   0080
      COMMON /NHIGH/ NSPHG,NLAST,XLAST(500),YLAST(500)                 A   0090
      COMMON /MWRTE/ IFLAG,NDY4,PROG,TITLE(9),BODIES(4),IDENT,YLO(25),YHA   0100
     1I(25),NDY(25),XRAK(25),NBDPTS(9),NO6,NRAKES
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(5COA   0120
     1),ALPHA(500),CAPPA(500),SON(500),PIO180                          A   0130
      COMMON /FOREOD/ IGEOMF,ISIGF,ICURVN,NONEWF,IVORT,ALPHER          A   0140
      COMMON /SUPF/ IFLD                                               A   0150
      COMMON/SEGNO/NSEG,J                                              A   0160
      COMMON /MAIN/-XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB,DELNEW      A   0170
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS                            A   0180
C((((((( THE GENERAL PLOTTING VARIABLES                                A   0190
      COMMON/ LOT/XMIN,YMIN,ORD,EXEP,XX,YY,LPNCHO,IPLOTA,MM            A   0200
      COMMON/TITL/ TTITL(9,6)                                          A   0210
      COMMON/TOL/BAGS(15),BAGX(15),ZAP(15),NZAP(15)                    A   0220
      COMMON/SENSE/  X(2),Y(2),A,B                                     A   0230
      COMMON/PAC/ PACE,DELSHL                                          A   0240
      DATA D2TEST/6H   23Y/
      DATA BLANK/6H      /                                             A   0250
      DATA EODFF/6HENDOFF/                                             A   0260
      DATA REDONE/6HREDONE/                                            A   0270
      PI=3.14159265                                                    A   0280
      PIO180=PI/180.                                                   A   0290
      PIO2=PI/2.                                                       A   0300
C                                                                      A   0310
C     WHEN NO6 = 1, A FLAG IN CARD COLUMN 6 IS PUNCHED FOR 500         A   0320
C      ONLY BASIC DATA WILL BE GIVEN IN 500 PROGRAM                    A   0330
```

```
C
      CALL PLOTID
C(((((( READ AXIS LABELS FOR THE MOST POPULAR PLOTTED VARIABLES
      READ (5,500)ARE
      READ (5,500)EX
      READ (5,500)CURVO
      READ (5,500)SURFAC
      CALL ECHO
   10 NIN=25
      READ (25,500,END=630)TITLE
      IF (FLD(0,36,TITLE(1)).EQ.FLD(0,36,EODFF)) GO TO 630
      REWIND 4
      LOWER=0
C(((((( READ GENERAL PLOTTING VARIABLES
      READ (25,555)XX,XMIN,EXEP,YY,YMIN,ORD
   15 FORMAT(4I1,F10.2,I1)
      READ (25,15)IGEOMF,ISIGF,ICURVN,NONEWF,ALPHER,IVORT
   20 READ (NIN,490)IDENT,PROG,NO6,LPNCHO,IPLOTA,IPLOTC,IREAD,IAB,(IREDO
     2N(I),I=1,5)
      LPDUM=LPNCHO
      IF(LPDUM.EQ.0)LPNCHO=1
      IF(LPDUM.EQ.1)LPNCHO=0
   25 JSTART=0
      JSTOP=0
      PACE=0.
      IF (IAB.LE.0) GO TO 30
      READ (NIN,625)XAA,YAA,XBB,YBB
      IBUMB=0
      WRITE (4,495)IDENT,PROG,NO6,(IREDON(I),I=2,4),IBUMB,(IREDON(I),I=
     24)
C(((((( LEEHI WILL CONTAIN THE VALUE OF N AT THE HIGHLIGHT. NEEDED TO SP
C(((((( THE CURVATURE VS. X PLOTS INTO INTERNAL AND EXTERNAL PORTIONS
C(((((( MM COUNTS THE NO. OF SEGMENTS ON SHROUD AS PLOTTING PROCEEDS
   30 MM=0
      LEEHI=9000
C(((((( LOAD AXIS LABELS INTO COMMON
      IF (NIN.EQ.4) GO TO 40
      DO 35 I=1,9
      TTITL(I,1)=TITLE(I)
      TTITL(I,2)=BLANK
      TTITL(I,3)=ARE(I)
      TTITL(I,4)=EX(I)
      TTITL(I,5)=CURVO(I)
   35 TTITL(I,6)=SURFAC(I)
   40 WRITE (6,525)IDENT,TITLE
      IF (NIN.EQ.4) WRITE (6,470)
      IF (NIN.EQ.4) GO TO 55
      WRITE (6,45)IGEOMF,ISIGF,ICURVN,NONEWF,IVORT
   45 FORMAT(1H ,60HFLAG INPUT, 1ST RECORD - FOREOD. 2ND - PUNCH,PLOT,RE
     1DO FLAGS/1H ,4I1,10X,I1)
      IF (IVORT.EQ.0) GO TO 50
      IVORT=0
      GO TO 55
   50 IVORT=1
   55 WRITE (6,60)IDENT,PROG,NO6,LPNCHO,IPLOTA,IPLOTC,IREAD,IAB,(IREDON(
     1I),I=1,5)
   60 FORMAT(1H       2A6,I4,2I1,2I2,10X,I1,9X,3I1,2I2)
```

```
      IF(ABS(XX).GT.100.) WRITE(6,64) XX
64    FORMAT(13HOXLEN (XX) = ,F10.2,30H,GT. 100.. CHECK FORMATS,INPUT)
      IF(ABS(XX).GT.100.) STOP
C(((((( PLOT THE AXES NEEDED FOR THE INLET PICTURE, AND LABEL THE CASE
   65 CALL PLOXIS(XX,YY,EXEP,ORD,XMIN,YMIN,.25,.25,0,0,1,2,1,1)
      CALL SYMBOL(-.3,YY-.5 ,.25,IDENT,0.,6)
      CALL SYMBOL(XX-1.50,.5,.25,IDENT,0.,6)
      IF(NIN.EQ.4)CALL SYMBOL(XX/2.,YY-.5,.25,REDONE,0.,6)
      IF (NIN.EQ.4) GO TO 75
C
C     READ INPUT CARDS FOR SUPERCIRCLE
C         1  -- CASE HEADER CARD -- NO. OF BODIES,CASE NO.,DELS,DELSMX
C      OFF-BODY
C         2 -- NRAKES = NUMBER OF RAKES (TOTAL NUMBER CANNOT EXCEED 25)
C         3 -- X,YLO,YHI, NY (DATA FOR EACH RAKE)
C              X = X OF THE RAKE,
C     YLO = Y OF THE FIRST PT. ON RAKE CLOSEST TO THE HUB - SHOULD BE
C                ABOUT DS GREATER THAN Y ON HUB
C     YHI = Y OF THE LAST PT ON RAKE CLOSEST TO THE SHROUD - SHOULD BE
C               ABOUT DS LESS THAN Y ON SHROUD
C              NY  = NO. OF PTS TO GENERATE FOR THAT RAKE
C     ON-BODY
C         FOR EACH SEGMENT A DESCRIPTION CARD IS NEEDED,
C           THIS CARD DENOTES THE TYPE OF LINE, AND THE
C           COORDINATES OF THE LINE (UP TO 6 SETS)
C
      READ (NIN,555,END=630)ANBDYS,DELS,DELSMX,XRI,ANNSD
      HOLYDS=DELS
      READ (NIN,485)NRAKES
      READ (NIN,550)(XRAK(I),YLO(I),YHI(I),NY(I),I=1,NRAKES)
      WRITE (6,480)ANBDYS,DELS,DELSMX,XRI
      DO 70 I=1,NRAKES

   70 NDY(I)=NY(I)-1
   75 NLAST=0
      NSPHG=0
      DSAVE=DELS
      DELS2=DELS
      DELS1=DELS
      NBDYS=ANBDYS
      NNSD=ANNSD
C
C     K = COUNTER FOR THE NUMBER OF ONBODY POINTS GENERATED
C     IHUB = 0, WHEN THERE IS ONLY ONE BODY-- IF THERE IS ONE BODY
C     IT MUST BE THE SHROUD
C     IFLAG = 0, IF THERE IS MORE THAN ONE BODY
C
      K=0
      IHUB=0
      IFLAG=1
C
C     NZ LOOP IS FOR THE NUMBER OF BODIES
C
      DO 225 NZ=1,NBDYS
      IFLD=0
      IF (NZ.GE.2) IFLAG=0
      IF (NZ.GE.2) IHUB=1
```

```
C
C
      READ (NIN,555)TYPBDY,ANSEG,DELNEW
      NUMBOD=IABS(IFIX(TYPBDY))
      WRITE(6,626) NUMBOD
      IF (IAB.GT.0) WRITE (4,555)TYPBDY,ANSEG,DELNEW
      NSEG=ANSEG
      IF(DELNEW.LT.0.)DELS1=HOLYDS
      IF(DELNEW.GT.0.)DELS1=DELNEW
      K=K+1
      IF (TYPBDY.LE.0.0) GO TO 215
      SON(K)=0.0
C
      IF(NZ.EQ.MBD)NSEG=NSEG-LOWER
C     SEGMENT LOOP
C
      DO 200 J=1,NSEG
C((((((  DIRECT INTERPOLATION FLAG--
   80 IF (NSEG.EQ.0) GO TO 155
      READ (NIN,555)ENREED,(REEDEN(I),I=1,2)
      IF (ENREED.EQ.0..OR.ENREED.GT.900.) WRITE (6,85)ENREED
   85 FORMAT(1H ,8HENREED= ,F9.2)
      IF (IAB.GT.0) WRITE (4,555)ENREED,(REEDEN(I),I=1,2)
      IF (ENREED.EQ.99.) GO TO 155
      READ (NIN,625)(XIN(I),I=1,3),XIN(6),(XIN(I),I=4,5)
      READ (NIN,625)(YIN(I),I=1,3),YIN(6),(YIN(I),I=4,5)
      IF (IAB.GT.0) WRITE (4,625)(XIN(I),I=1,3),XIN(6),(XIN(I),I=4,5)
      IF (IAB.GT.0) WRITE (4,625)(YIN(I),I=1,3),YIN(6),(YIN(I),I=4,5)
   90 KSV=K
      CAPPA(K)=0.0
      IF (ENREED.NE.1.0.AND.ENREED.NE.10.) GO TO 105
      XON(K)=XIN(1)
      YON(K)=YIN(1)
      WRITE (6,570)ENREED,(XIN(I),I=1,2),(YIN(I),I=1,2)
C(((((( KK= FIRST POINT ON CURRENT SEGMENT TO BE PLOTTED
      KK=K
      IF (TYPBDY.GE.2.0) GO TO 100
      IF (ENREED.EQ.1.0.AND.J.EQ.NSEG) CALL FNSTRH (K)
      IF (ENREED.EQ.1.0.AND.J.NE.NSEG) CALL STRAIT (K,0.0)


      IF (ENREED.EQ.10.) CALL FRSTSH (K)
   95 DYDXO(KSV)=DYDXO(KSV+1)
      ALPHA(KSV)=ALPHA(KSV+1)
CC(((((( KR= TOTAL NO. OF POINTS TO BE PLOTTED FOR THIS SEGMENT
      KR=K-KK
C(((((( PLOT CURRENT SEGMENT
      CALL DRAW(KR,KK)
      GO TO 160
  100 IF (J.EQ.1) CALL FRSTSH (K)
      IF (J.EQ.NSEG) CALL FNSTRH (K)
      IF (J.NE.1.'. ...' .NSEG) CALL'STRAIT (K,0.0)
      GO TO 95
105   IF(ENREED.LT.-3.0)GOTO216
      IF (ENREED.LT.-2.0) GO TO 150
      IF (ENREED.LT.-1.0) GO TO 140
```

```
      IF (ENREED.LT.0.0) GO TO 135
C
C     SET-UP SUPER ELLIPSE
C
      KPREP=0
      ENRD=ENREED-1000.
      IF (ENRD.LT.0.0) GO TO 110
      PACE=ENREED-1000.
      IF(PACE.LE.0.)PACE=.05
      ENREED=0.
      IFLD=IFLD+1
      GO TO 115
  110 IFLD=0
  115 WRITE (6,575)REEDEN(1),(XIN(I),I=1,3),XIN(6),(XIN(I),I=4,5),REEDEN
     1(2),(YIN(I),I=1,3),YIN(6),(YIN(I),I=4,5)
      CALL TEST (5)
      ISTART=K
      K1=K
      KK=K
      CALL SUPERC(XIN,YIN,REEDEN,DELS1,ISTART)
      K=I0-1
      IF (NZ.EQ.1) GO TO 125
      KKKK=K-1
      DO 120 JE=ISTART,KKKK
      IF (XON(JE).EQ.XON(JE+1)) GO TO 120
      IF((DYDXO(JE)-DYDXO(JE+1))/(XON(JE)-XON(JE+1))*CAPPA(JE).LT.0.)CAP
     1PA(JE)=-CAPPA(JE)
  120 CONTINUE
  125 K2=K
      IDUM=0
      IF (KPREP.EQ.0) GO TO 130
      CALL PRELPS (IDUM,1,5,K1,K2)
  130 KR=K-KK
      CALL DRAW(KR,KK)
      GO TO 160
C
C     SET-UP LEMNISCATE
C
  135 WRITE (6,580)ENREED,(XIN(I),I=1,3),(YIN(I),I=1,3)
      KK=K
      CALL LEM (K)
      K=K+1
      KR=K-KK
      CALL DRAW(KR,KK)
      GO TO 160
C
C     SET-UP ELLIPSE
C
  140 WRITE (6,585)ENREED,(XIN(I),I=1,4),(YIN(I),I=1,4)
      KPREP=0
      CALL TEST (4)
      K1=K
      KK=K
      CALL ELIPSE (K)
      K=K+1
      K2=K
```

```
      IDUM=0
      IF (KPREP.EQ.0) GO TO 145
      CALL PRELPS (IDUM,1,4,K1,K2)
  145 KR=K-KK
      CALL DRAW(KR,KK)
      GO TO 160
C
C     SET-UP CUBIC
C
  150 WRITE (6,605)ENREED,(XIN(I),I=1,4),(YIN(I),I=1,4)
      KK=K
      CALL CUBIC (K)
      K=K+1
      KR=K-KK
      CALL DRAW(KR,KK)
      GO TO 160
C(((((( NEW LINEAR INTEGRATION OPTION, BODY OR FULL INLET
  155 KK=K
      KSV=K
      CAPPA(K)=0.0
      IF(NSEG.EQ.0)DELSI=DELSMX
      CALL XYCALC(K,K2,NIN)
      K=K2
      KR=K-KK
      CALL DRAW(KR,KK)
      GOTO160
216   KTOT=0
      KBEGIN=0
      KSTOP=0
      DO 219 JBOP=1,K
      IF(XIN(1).EQ.XON(JBOP).AND.YIN(1).EQ.YON(JBOP))KBEGIN=JBOP
      IF(XIN(2).EQ.XON(JBOP).AND.YIN(2).EQ.YON(JBOP))KSTOP=JBOP
      IF(KSTOP*KBEGIN.NE.0)GOTO221
219   CONTINUE
      WRITE(6,222)KBEGIN,KSTOP
221   KTOT=KSTOP-KBEGIN+1
      YCL=YIN(3)
      WRITE(6,223)YCL,ENREED,(XIN(L2),L2=1,2),(YIN(L2),L2=1,2)
      KK=K
      CALL MIRROR(K,KTOT,KBEGIN,YCL)
      KR=K-KK
      CALL DRAW(KR,KK)
218   FORMAT('0BODY NO. ',I4,' WILL BE GENERATED AS A MIRROR IMAGE OF ',
     1'BODY NO. ',I4,'ABOUT AN AXIS AT Y= ',E15.4)
222   FORMAT('0SEARCH FOR SEGMENT TO BE MIRRORED HAS FAILED',2I4)
223   FORMAT(1H0,10X,'ENREED   THIS SEGMENT IS A MIRROR IMAGE ABOUT THE'
     1,' Y= ',1P1E15.4,'LINE'/20X,' THE ORIGINAL SEGMENT LIES BETWEEN',
     2' THE FOLLOWING POINTS'/11X,F6.3,5X,2HX,1P2E15.4/22X,1HY,1P2E15.4)
  160 IF (IAB.LE.0) GO TO 200
      IF(ABS(XON(KK)-XAA+YON(KK)-YAA).LE.1.E-7)JSTART=KK
      IF(ABS(XON(K) -XBB+YON(K) -YBB).LE.1.E-7)JSTOP=K
      IF(JSTART.EQ.KK)MBD=NZ
      IF ((JSTART+JSTOP).EQ.0.OR.(JSTOP.GT.0.AND.K.GT.JSTOP)) GO TO 200
      DO 165 K9=1,3
  165 BACKSPACE 4
      IF (JSTART.NE.KK) GO TO 180
      WRITE (4,170)
```

```
  170 FORMAT(3X,3H99.,74X)
      WRITE (4,445)XON(KK),YON(KK)
      KK1=KK+1
      DO 175 K9=KK1,K
  175 WRITE (4,450)XON(K9),YON(K9)
      BACKSPACE 4
      IF (JSTOP.NE.K) GO TO 180
      WRITE (4,455)XON(K),YON(K)
      GO TO 200
  180 IF (JSTOP.NE.K) GO TO 190
      LOWER=LOWER+1
      KM1=K-1
      DO 185 K9=KK,KM1
  185 WRITE (4,450)XON(K9),YON(K9)
      WRITE (4,455)XON(K),YON(K)
      GO TO 200
  190 IF (JSTART.EQ.KK.AND.JSTOP.EQ.0) GO TO 200
      LOWER=LOWER+1
      KM1=K-1
      DO 195 K9=KK,KM1
  195 WRITE (4,450)XON(K9),YON(K9)
  200 WRITE (6,205)K,XON(K),YON(K),CAPPA(K),DYDXO(K),ALPHA(K)
  205 FORMAT(1HO,3X,11HLAST POINT ,2HK=,I5,4H, X=,E12.5,4H, Y=,E12.5,7H,
     1KAPPA=,E12.5,7H,DY/DX=,E12.5,7H,ALPHA=, E12.5)
C
C     END OF SEGMENT LOOP
C
210   GOTO220
 215  MIRBOD=IFIX(( ABS(TYPBDY)-FLOAT(NUMBOD))*10.1)
      YCL=ANSEG
      KTOT=NBDPTS(MIRBOD)-NBDPTS(MIRBOD-1)
      KBEGIN=NBDPTS(MIRBOD-1)+1
      IF(MIRBOD.EQ.1)KBEGIN=1
      IF(MIRBOD.EQ.1)KTOT=NBDPTS(1)
      WRITE(6,218)NUMBOD,MIRBOD,YCL
      KK=K
      CALL MIRROR(K,KTOT,KBEGIN,YCL)
      KR=K-KK
      CALL DRAW(KR,KK)
  220 NBDPTS(NZ)=K
      NBDY1=NBDPTS(1)
      NBODY2=NBDPTS(2)
      TYP(NZ)=TYPBDY
      KAY(NZ)=K
  225 CONTINUE
C
C     END OF BODY LOOP
C
      ITOP12=K
      IF(IFLAG.EQ.1)NBODY2=ITOP12
      DELSND =DELS
      IF (IFLAG.EQ.1) NBDY1=0
C9
C
C     CO-ORDINATES OF POINTS ON DOWNSTREAM CLOSURE
C
C
```

```
C         STRAIGHT SECTION BETWEEN HUB AND SHROUD OR SPLITTER
C
C
          ITOPT4=K+1
          ITOPT5=K+1
          ITOPT6=K+2
          ITOPT7=K+2
          IF(IVORT.EQ.1) GOTO 255
          IF (NBDY1.EQ.0) GO TO 230
          YNBDY1=YON(NBDY1)
          Y4SAVE=YON(NBDY1)
          Y5SAVE=YON(NBDY1+1)
          Y6SAVE=YON(NBODY2)
          Y7SAVE=YON(NBODY2+1)
          GO TO 235
  230     YNBDY1=0.0
          Y4SAVE=0.0
  235     NDY4=(YON(NBDY1+1)-YNBDY1)*1.5/DELSMX
          ENDY4=NDY4
          NPTS=NDY4+1
          NBDPTS(NBDYS+1)=NPTS+NBDPTS(NBDYS)
          DY4=(YON(NBDY1+1)-YNBDY1)/ENDY4
          DO 240 I=1,NPTS
          AYEM=I-1
          IPN=I+K
          XON(IPN)=XON(NBDY1+1)
          YON(IPN)=YNBDY1+AYEM*DY4
  240     CONTINUE
  245     ITOPT4=K+1
          ITOPT5=ITOPT4+NDY4
          IF (NBDYS.LE.2) GO TO 255
C
C
C         STRAIGHT SECTION BETWEEN FLOW SPLITTER AND SHROUD
C
C
          YNBDY2=Y6SAVE
          NDY5=(Y7SAVE-Y6SAVE)*1.5/DELSMX
          ENDY5=NDY5
          NPTS=NDY5+1
          NBDPTS(NBDYS+2)=NPTS+NBDPTS(NBDYS+1)
          DY5=(Y7SAVE-Y6SAVE)/ENDY5
          DO 250 I=1,NPTS
          AYEM=I-1
          IPN=I+ITOPT5
          XON(IPN)=XON(NBODY2+1)
          YON(IPN)=YNBDY2+AYEM*DY5
  250     CONTINUE
          ITOPT6=ITOPT5+1
          ITOPT7=ITOPT6+NDY5
C
C              CALL SUBROUTINE TO WRITE AND PUNCH CARDS
C
  255     CALL WPUNCH
          IF (NBDYS.GT.2) GO TO 260
          NT1=ITOPT5-3
          NT2=K-2
```

```
      GO TO 265
  260 NT1=ITOPT7-5
      NT2=ITOPT5-4
      NT3=K-3
      NSPLMX=NBODY2-2
  265 NHUBMX=NBDY1-1
      NP=0
      DO 270 I=1,NRAKES
      NP=NP+NDY(I)+1
  270 CONTINUE

      IF (NBDYS.LE.2) GO TO 275
      WRITE (6,565)NT1,NT2,NT3,NHUBMX,NSPLMX,NP
      GO TO 285
  275 IF (NHUBMX.GT.0) GO TO 280
      NHUBMX=NHUBMX+1
      NT1=NT1+1
      NT2=NT2+1
  280 WRITE (6,540)NT1,NT2,NHUBMX,NP
C
C     CALCULATING HUB SURFACE DISTANCE (S-S(2))
C
  285 CALL SINTP (XON,SON,NBDY1,XRI,S2)
      WRITE (6,505)
      IF (IFLAG.EQ.1) GO TO 295
      SDEL=0.0
      DO 290 I=1,NBDY1
      IF (I.NE.1) SDEL=SON(I)-SON(I-1)
      SD(I)=SON(I)-S2
  290 WRITE (6,520)I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),SD(
     1I),SDEL
C
C     CALCULATION SHROUD OR LOWER FLOW SPLITTER SURFACE DISTANCE
C
  295 NBP1=NBDY1+1
      IF (NBDYS.EQ.1) NBODY2=ITOP12
      DO 300 I=NBP1,NBODY2
      JJ=I
      IF (XON(I).LT.XON(I+1)) GO TO 305
  300 CONTINUE
  305 CALL SINTP (XON(NBP1),SON(NBP1),JJ-NBDY1,XRI,S22)
      IF (IFLAG.EQ.1) GO TO 310
      WRITE (6,510)
  310 IF (NBDYS.LE.2) JJ=NBODY2
      SDEL=0.0
      DO 315 I=NBP1,JJ
      IF (I.NE.NBP1) SDEL=SON(I)-SON(I-1)
      S(I)=S22-SON(I)
  315 WRITE (6,520)I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),S(I
     1),SDEL
      IF (NBDYS.LE.2) GO TO 340
C
C      CALCULATING FLOW SPLITTER UPPER SURFACE DISTANCE
C
      JJ=JJ+1
      WRITE (6,530)
      CALL SINTP (XON(JJ),SON(JJ),NBODY2-JJ,XRI,S23)
```

```
      SDEL=0.0
      DO 320 I=JJ,NBODY2
      IF (I.NE.JJ) SDEL=SON(I)-SON(I-1)
      S(I)=SON(I)-S23
  320 WRITE (6,520)I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),S(I
     1),SDEL
C
C     CALCULATING SHROUD SURFACE DISTANCE (IF THERE IS A FLOW SPLITTER)
C
      NBP1=NBODY2+1
      DO 325 I=NBP1,ITOP12
      JJ=I
      IF (XON(I).LT.XON(I+1)) GO TO 330
  325 CONTINUE
  330 CALL SINTP (XON(NBP1),SON(NBP1),JJ-NBODY2,XRI,S33)
      WRITE (6,535)
      SDEL=0.0
      DO 335 I=NBP1,ITOP12
      IF (I.NE.NBP1) SDEL=SON(I)-SON(I-1)
      S(I)=S33-SON(I)
  335 WRITE (6,520)I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),S(I
     1),SDEL
C
  340 NBDSV=NBDYS
      IF (NNSD.EQ.0) GO TO 350
      NS=1
  345 IBD=NBDYS+NS
      INSD=I+NSDBDY(NS)
      IBNSD=I+1
      WRITE (6,610)IBD
      WRITE (6,615)(I,XON(I),YON(I),CAPPA(I),DYDXO(I),ALPHA(I),SON(I),I=
     1IBNSD,INSD)
      NS=NS+1
      IF (NS.LE.NNSD) GO TO 345
      NBDYS=IBD
C
C     WRITE OUT CLOSURE COORDINATES
C
  350 IBD=NBDYS+1
      IF(IVORT.EQ.1) GOTO 355
      WRITE (6,515)IBD,(I,XON(I),YON(I),I=ITOPT4,ITOPT5)
      IF (NBDSV.NE.3) GO TO 355
      IBD=IBD+1
      WRITE (6,515)IBD,(I,XON(I),YON(I),I=ITOPT6,ITOPT7)
  355 WRITE (6,545)(XRAK(I),YLO(I),YHI(I),NY(I),I=1,NRAKES)
      IF(PROG.NE.D2TEST) CALL AREAA
C
C(((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((
C
C((((((          CURVATURE PLOTS      ((((((((((((((((((((((((((((((((((((
C
      LEL=6
C(((((( IF IPLOTC IS NOT ZERO,  PLOT THE CURVATURE VS. S(IF IPLOTC .GT.0
C((((((                                         OR VS.X (IF IPLOTC .LT.0
      IF (IPLOTC.EQ.0) GO TO 405
      IF(IPLOTC.LT.0) LEL=4
      LE=0
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
C(((((( LEA = LAST PT. ON SHROUD
      LEA=ITOPT4-1
      LL=1
C(((((( TEST EACH SHROUD PT. FOR     1) IN RANGE OF X-AXIS
C((((((                              2) BEFORE OR AFTER HIGHLIGHT
C((((((                              3) FINITE CURVATURE
  360 LEE=LL+NBDPTS(1)
      IF (XON(LEE).GT.(XX*EXEP+XMIN)) GO TO 375
      IF (XON(LEE).LT.XON(LEE+1).AND.LEE.LT.LEEHI) GO TO 365
      IF (CAPPA(LEE).EQ.99999.) GO TO 375
      LE=LE+1
      DIST(LE)= SON(LEE)
      CAPPER(LE)= CAPPA(LEE)
C(((((( FLAG THE HIGHLIGHT
      IF (XON(LEE).GT.XON(LEE+1)) GO TO 370
  365 IF(LEE.LT.LEEHI) LEEHI=LEE
C(((((( USE ABSOLUTE VALUE OF CURVATURE ON EXTERIOR OF SHROUD
      IF(CAPPER(LE).LT.0.) CAPPER(LE)=-CAPPER(LE)
  370 IF(IPLOTC.LT.0) DIST(LE)=XON(LEE)
C(((((( IF CURVAT.-VS.-X PLOT IS NEEDED AND HIGHLIGHT HAS BEEN REACHED,
C(((((( PLOT THE FIRST FRAME (INTERNAL SHROUD PTS.)
      IF (IPLOTC.LT.0.AND.LEE.EQ.LEEHI) GO TO 380
  375 LL=LL+1
      IF (LL.LE.(ITOPT4-1-NBDPTS(1))) GO TO 360
  380 CALL PLOT(XX,0.,-3)
C(((((( IF THE SECOND X-CURVE (EXTERNAL PTS.) IS BEING PLOTTED, DO NOT
C(((((( GENERATE NEW SCALE FACTORS. USE THOSE OF THE INTERNAL PLOT.
      IF (LEE.GT.LEEHI.AND.IPLOTC.LT.0) GO TO 385
      CALL CSCALE(CAPPER,YY,LE,1,10,EXMIN,DEEX)
  385 CAPPER(LE+1)=EXMIN
      CAPPER(LE+2)=DEEX
      IF (LEE.GT.LEEHI.AND.IPLOTC.LT.0) GO TO 390
      CALL CSCALE(DIST ,YY,LE,1,10,EXMIND,DEEXD)
  390 DIST(LE+1)=EXMIND
      DIST(LE+2)=DEEXD
      IF(IPLOTC.LT.0) DIST(LE+1)= XMIN
      IF(IPLOTC.LT.0) DIST(LE+2)= EXEP
C((((((     DRAW AXES FOR CURVATURE PLOT
      CALL PLOXIS(XX,YY,DIST(LE+2),CAPPER(LE+2),DIST(LE+1),CAPPER(LE+1),
     1.25,.25,0,0,LEL,5,1,2)
      CALL LINE(DIST,CAPPER,LE,1,1,3,DIST(LE+1),DIST(LE+2),CAPPER(LE+1),
     1CAPPER(LE+2))
C((((((     DRAW SEGMENT MARKERS
      DO 400 MEM=1,MM
      IF(IPLOTC.LT.0) BAGS(MEM)=BAGX(MEM)
      IF(ZAP(MEM).LT.0..AND.NZAP(MEM).GT.LEEHI) ZAP(MEM)=-ZAP(MEM)
      IF(ZAP(MEM).EQ.99999.) ZAP(MEM)=YY*CAPPER(LE+2) + CAPPER(LE+1)
      IF (LEE.GT.LEEHI.AND.IPLOTC.LT.0) GO TO 395
      BAGS(MEM)=(BAGS(MEM)-DIST(LE+1))/DIST(LE+2)
      ZAP(MEM)=(ZAP(MEM)-CAPPER(LE+1)) /CAPPER(LE+2)
      IF(IPLOTC.GT.0.AND. NZAP(MEM).LT.LEEHI) CALL SYMBOL(BAGS(MEM),ZAP(
     1MEM),.2,1,0.,-1)
  395 IF (IPLOTC.LT.0.AND.BAGS(MEM).GT.(XX*EXEP+XMIN)) GO TO 400
      IF((NZAP(MEM).LE.LEEHI.AND.LEE.EQ.LEEHI).OR.(NZAP(MEM).GE.LEEHI.AN
     1D.LEE.NE.LEEHI)) CALL SYMBOL(BAGS(MEM),ZAP(MEM),.2,1,0.,-1)
  400 CONTINUE
      IF (LL.GT.(ITOPT4-1-NBDPTS(1)).OR.LEE.GT.LEEHI.OR.XON(LEE).EQ.XON(
```

```
     1LEA)) GO TO 405
      LE=0
      CALL SYMBOL(XX-.5,YY-.5,.3,52,0.,-1)
      GO TO 375
C
C((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((
C
C((((((  ADVANCE THE PLOT ORIGIN FOR THE NEXT CASE
  405 CALL PLOT(XX,0.,-3)
C(((((( IF THE CASE IS NOT TO BE REWORKED VIA FESSLER, BEGIN NEXT JOB
      IF (IAB.LE.0) GO TO 410
      REWIND 4
      NIN=4
      DELS =DSAVE
      GO TO 20
  410 IF (IREDON(1).EQ.0) GO TO 10
      REWIND 4
      LPNCHO= IREDON(2)
      IPLOTA= IREDON(3)
      IPLOTC= IREDON(4)
      IREAD = IREDON(5)
      IREDON(1)=  IREDON(1)- 1
C(((((( WRITE THE ORIGINAL CASE OUTPUT ON UNIT 4 FOR ACCEPTANCE AS INPUT
C   BY DIRECT INTERPOLATION OPTION(XYCALC,FESSLER)
      WRITE (4,475)IDENT,PROG,NO6,LPNCHO,IPLOTA,IPLOTC,IAB,(IREDON(I),I=
     21,4)
      DO 425 I=1,NBDYS
      IF(NBDYS.EQ.2.AND.I.EQ.2) TYP(I)=2.
      IF (I.EQ.1) GO TO 415
      KA= KAY(I-1)+2
      GO TO 420
  415 KA=2
  420 WRITE (4,440)TYP(I)
      KB= KAY(I)-1
      KAB=KA-1
      WRITE (4,445)XON(KAB),YON(KAB)
      WRITE (4,450)(XON(J),YON(J),J=KA,KB)
      KC=KAY(I)
      WRITE (4,455)XON(KC),YON(KC)
  425 CONTINUE
      IF (NNSD.EQ.0) GO TO 435
      WRITE (4,460)DELSND
      NTOT=0
      DO 430 N=1,NNSD
      NKA1=KAY(NBDYS)+ NTOT +1
      NTOT= NTOT+ NSDBDY(N)
      WRITE (4,465)XON(NKA1),YON(NKA1)
      NA =NKA1+1
      NB =NKA1+ NSDBDY(N)  -2
      WRITE (4,450)(XON(J),YON(J),J=NA,NB)
      NC =NB+1
      WRITE (4,455)XON(NC),YON(NC)
  430 CONTINUE
  435 NIN=4
      REWIND 4
      GO TO 20
  440 FORMAT(F10.2,10H   0.
```

```
  445 FORMAT(1X,11H$BODYIN Z=(,F10.6,1H,,F10.6,4H),   )                  A
  450 FORMAT(12X,1H(,F10.6,1H,,F10.6,3H), )                               A
  455 FORMAT(12X,1H(,F10.6,1H,,F10.6,3H) $/1X,20H$AUXIN DONE=.TRUE. $)    A
  460 FORMAT(8F10.2)                                                      A
  465 FORMAT(3X,7H-1      /1X,11H$BODYIN Z=(,F10.6,1H,,F10.6,4H),   )     A
  470 FORMAT(1H+,13X,6HREDONE)                                            A
  475 FORMAT(        2A6,I4,2I1, I2,12X,I1,9X,3I1, I2)                    A
C                                                                         A
C     FORMATS                                                             A
C                                                                         A
C                                                                         A
  480 FORMAT (1H0,10X,16HNO. OF BODIES = ,F2.0,5X,7HDELS = ,F6.3,5X,9HDEA
     1LSMX = ,F6.3,5X,6HXRI = ,F10.6)                                     A
  485 FORMAT (20I4)                                                       A
  490 FORMAT(        2A6,I4,2I1,2I2,10X,I1,9X,3I1,2I2)                    A
  495 FORMAT(        2A6,I4,2I1, I2,12X,1H0,9X,3I1, I2)                   A
  500 FORMAT (9A6)                                                        A
  505 FORMAT (1X/1X23HBODY 1 CO-ORDINATES - X12X1HY10X5HKAPPA10X5HDY/DX1A
     10X5HALPHA5X1HS8X6HS-S(2),8X,6HDELTAS/1X)                            A
  510 FORMAT (1X/1X23HBODY 2 CO-ORDINATES - X12X1HY10X5HKAPPA10X5HDY/DX1A
     10X5HALPHA5X1HS,8X,7HS*(2)-S,8X,6HDELTAS/1X)                         A
  515 FORMAT (1X/1X5HBODY I1,17H CO-ORDINATES - X12X1HY/1X/(9XI4,3XE12.5A
     1,E13.5))                                                            A
  520 FORMAT (9XI4,3XE12.5,7E13.5)                                        A
  525 FORMAT (6H1CASE A6,10X,9A6/1X)                                      A
  530 FORMAT (1H0)                                                        A
  535 FORMAT (1X/1X,23HBODY 3 CO-ORDINATES - X,12X,1HY,10X,5HKAPPA,10X,5A
     1HDY/DX,10X,5HALPHA,5X,1HS,8X,6HS-S(3),8X,6HDELTAS/1X)               A
  540 FORMAT (/10X,30H INPUT FOR THE COMBINE PROGRAM,7H NT(1)=,I4,7H NT(A
     12)=,I4,8H NHUBMX=,I4,4H NP=,I4/)                                    A
  545 FORMAT (1X,4HXRAK,10X,3HYLO,11X,3HYHI,16X,3HNDY//,(3E14.5,5X,I3)) A
  550 FORMAT (3E8.5,I3)                                                   A
  555 FORMAT (8F10.2)                                                     A
  560 FORMAT( F10.2,10F7.4/F7.5,F7.2)                                     A
  565 FORMAT (/5X,30H INPUT FOR THE COMBINE PROGRAM,7H NT(1)=,I4,7H NT(2A
     1)=,I4,7H NT(3)=,I4,8H NHUBMX ,I4,8H NSPLMX=,I4,4H NP=,I4/)          A
  570 FORMAT (1H0,10X,6HENREED,10X,13HSTRAIGHT LINE/11X,F6.3,5X,1HX,1P2EA
     115.4/22X,1HY,1P2E15.4)                                              A
  575 FORMAT(1H0,7X,9HEXPONENTS,10X,12HSUPERELLIPSE/7X,4HP = ,F6.3,5X,1HA
     1X,1P6E15.4/7X,4HQ = ,0PF6.3,5X,1HY,1P6E15.4)                        A
  580 FORMAT (1H0,10X,6HENREED,10X,10HLEMNISCATE/11X,F6.3,5X,1HX,1P3E15.A
     14/22X,1HY,1P3E15.4)                                                 A
  585 FORMAT (1H0,10X,6HENREED,10X,7HELLIPSE/11X,F6.3,5X,1HX,1P4E15.4/22A
     1X,1HY,1P4E15.4)                                                     A
  590 FORMAT (1H0,2X,18H**** HUB *********)                               A
  595 FORMAT (1H0,2X,18H**** SHROUD ******)                               A
  600 FORMAT (1H0,2X,18H**** SPLITTER ****)                               A
  605 FORMAT (1H0,10X,6HENREED,10X,5HCUBIC/11X,F6.3,5X,1HX,1P4E15.4/22X,A
     11HY,1P4E15.4)                                                       A
  610 FORMAT (1X/1X,5HBODY,I2,17H CO-ORDINATES - X,12X,1HY,10X,5HKAPPA,1A
     10X,5HDY/DX,10X,5HALPHA,5X,1HS,8X,6HS-S(2),8X,6HDELTAS/1X)           A
  615 FORMAT (9X,I4,3X,E12.5,5E13.5)                                      A
  620 FORMAT(2F10.7)                                                      A
626    FORMAT(8H0  BODY ,I2)
  625 FORMAT(6F12.5)                                                      A
  630 CALL PLOT(3.,0.,-3)                                                 A
      CALL PLOTID                                                         A
```

```
      STOP                                                             A    6920
      END                                                              A    6930
```

```
C     ..................................................................
C
C        SUBROUTINE SIMQ
C
C        PURPOSE
C           OBTAIN SOLUTION OF A SET OF SIMULTANEOUS LINEAR EQUATIONS,
C           AX=B
C        USAGE
C           CALL SIMQ(A,B,N,KS)
C
C        DESCRIPTION OF PARAMETERS
C           A - MATRIX OF COEFFICIENTS STORED COLUMNWISE.  THESE ARE
C               DESTROYED IN THE COMPUTATION.  THE SIZE OF MATRIX A IS
C               N BY N.
C           B - VECTOR OF ORIGINAL CONSTANTS (LENGTH N). THESE ARE
C               REPLACED BY FINAL SOLUTION VALUES, VECTOR X.
C           N - NUMBER OF EQUATIONS AND VARIABLES. N MUST BE .GT. ONE.
C           KS - OUTPUT DIGIT
C                0 FOR A NORMAL SOLUTION
C                1 FOR A SINGULAR SET OF EQUATIONS
C
C        REMARKS
C           MATRIX A MUST BE GENERAL.
C           IF MATRIX IS SINGULAR , SOLUTION VALUES ARE MEANINGLESS.
C           AN ALTERNATIVE SOLUTION MAY BE OBTAINED BY USING MATRIX
C           INVERSION (MINV) AND MATRIX PRODUCT (GMPRD).
C
C        SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
C           NONE
```

```
C
C        METHOD
C           METHOD OF SOLUTION IS BY ELIMINATION USING LARGEST PIVOTAL
C           DIVISOR. EACH STAGE OF ELIMINATION CONSISTS OF INTERCHANGING
C           ROWS WHEN NECESSARY TO AVOID DIVISION BY ZERO OR SMALL
C           ELEMENTS.
C           THE FORWARD SOLUTION TO OBTAIN VARIABLE N IS DONE IN
C           N STAGES. THE BACK SOLUTION FOR THE OTHER VARIABLES IS
C           CALCULATED BY SUCCESSIVE SUBSTITUTIONS. FINAL SOLUTION
C           VALUES ARE DEVELOPED IN VECTOR B, WITH VARIABLE 1 IN B(1),
C           VARIABLE 2 IN B(2),........., VARIABLE N IN B(N).
C           IF NO PIVOT CAN BE FOUND EXCEEDING A TOLERANCE OF 0.0,
C           THE MATRIX IS CONSIDERED SINGULAR AND KS IS SET TO 1. THIS
C           TOLERANCE CAN BE MODIFIED BY REPLACING THE FIRST STATEMENT.
C
C     ..................................................................
C
      SUBROUTINE SIMQ (A,B,N,KS)
      DIMENSION A(1), B(1)
C
C        FORWARD SOLUTION
C
      TOL=0.0
      KS=0
      JJ=-N
      DO 45 J=1,N
      JY=J+1
      JJ=JJ+N+1
      BIGA=0
      IT=JJ-J
      DO 15 I=J,N
C
C        SEARCH FOR MAXIMUM COEFFICIENT IN COLUMN
C
      IJ=IT+I
      IF (ABS(BIGA)-ABS(A(IJ))) 10,15,15
   10 BIGA=A(IJ)
      IMAX=I
   15 CONTINUE
C
C        TEST FOR PIVOT LESS THAN TOLERANCE (SINGULAR MATRIX)
C
      IF (ABS(BIGA)-TOL) 20,20,25
   20 KS=1
      RETURN
C
C        INTERCHANGE ROWS IF NECESSARY
C
   25 I1=J+N*(J-2)
      IT=IMAX-J
      DO 30 K=J,N
      I1=I1+N
      I2=I1+IT
      SAVE=A(I1)
      A(I1)=A(I2)
      A(I2)=SAVE
C
```

```
C        DIVIDE EQUATION BY LEADING COEFFICIENT
C
   30 A(I1)=A(I1)/BIGA
      SAVE=B(IMAX)
      B(IMAX)=B(J)
      B(J)=SAVE/BIGA
C
C        ELIMINATE NEXT VARIABLE
C
      IF (J-N) 35,50,35
   35 IQS=N*(J-1)
      DO 45 IX=JY,N
      IXJ=IQS+IX
      IT=J-IX
      DO 40 JX=JY,N
      IXJX=N*(JX-1)+IX
      JJX=IXJX+IT
   40 A(IXJX)=A(IXJX)-(A(IXJ)*A(JJX))
   45 B(IX)=B(IX)-(B(J)*A(IXJ))
C
C        BACK SOLUTION
C
   50 NY=N-1
      IT=N*N
      DO 55 J=1,NY
      IA=IT-J
      IB=N-J
      IC=N
      DO 55 K=1,J
      B(IB)=B(IB)-A(IA)*B(IC)
      IA=IA-N
   55 IC=IC-1
      RETURN
      END
```

```
      SUBROUTINE STRAIT (K,ISHR)
C
C      A REGULAR STRAIGHT SEGMENT
C
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /FOR3SS/I0,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(50
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /FNST/ NFIRST
      COMMON /NHIGH/ NSPHG,NLAST,XLAST(500)
      KFIRST=K
      XTEST=XIN(2)-XIN(1)
      YTEST=YIN(2)-YIN(1)
      IF (XTEST.EQ.0.0) GO TO 10
      DYDXC=YTEST/XTEST
      ALPHAC=ATAN(YTEST/XTEST)
      GO TO 15
   10 DYDXC=99999.
      ALPHAC=PIO2
C
C     CALCULATE DELSNW
C
   15 STOT=SQRT(XTEST**2+YTEST**2)
      ANDS=STOT/DELS1
      AINDS=AINT(ANDS)
      TEST=ANDS-AINDS
      IF (TEST.GE..5) AINDS=AINDS+1.0
      DELSNW=STOT/AINDS
      DELS[illegible](DELSNW)
      DELS1=DELSNW
      DELS=DELS1
      IF (YTEST) 20,35,20
   20 IF (XTEST.EQ.0.0) GO TO 50
      DYDXO(K+1)=DYDXC
      ALPHA(K+1)=ALPHAC
      SIGN=1.0
      IF (XTEST.LT.0.0) SIGN=-1.0
      YON(K+1)=YON(K)+SIGN*DELSNW*SIN(ALPHA(K+1))
      IF (NSPHG.EQ.0) GO TO 25
      XON(K+1)=XON(NLAST-1)
      NLAST=NLAST-1
      GO TO 30
   25 XON(K+1)=XON(K)+SIGN*DELSNW*COS(ALPHA(K+1))
   30 SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
      CAPPA(K+1)=0.0
      IF (XTEST.LT.0.0.AND.XON(K+1).LE.XIN(2).OR.XTEST.GT.0.0.AND.XON(K+
     11).GE.XIN(2)) GO TO 55
      IF (ABS(XON(K+1)-XIN(2)).LE.1.0E-4*DELS.AND.ABS(YON(K+1)-YIN(2)).L
     1E.1.0E-4*DELS) GO TO 60
      K=K+1
      GO TO 20
   35 DYDXO(K+1)=0.0
      ALPHA(K+1)=0.0
      SIGN=1.0
      IF (XTEST.LT.0.0) SIGN=-1.0
      IF (NSPHG.EQ.0) GO TO 40
      XON(K+1)=XON(NLAST-1)
      NLAST=NLAST-1
```

```
      GO TO 45
   40 XON(K+1)=XON(K)+SIGN*DELSNW                                        B   0580
   45 YON(K+1)=YON(K)                                                    B   0590
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)    B   0600
      CAPPA(K+1)=0.0                                                     B   0610
      IF (XTEST.LT.0.0.AND.XON(K+1).LE.XIN(2).OR.XTEST.GT.0.0.AND.XON(K+B   0620
     1 1).GE.XIN(2)) GO TO 55                                            B   0630
      IF (ABS(XON(K+1)-XIN(2)).LE.1.0E-4*DELS.AND.ABS(YON(K+1)-YIN(2)).LB   0640
     1E.1.0E-4*DELS) GO TO 60                                            B   0650
      K=K+1                                                              B   0660
      GO TO 35                                                           B   0670
   50 DYDXO(K+1)=99999.                                                  B   0680
                                                                         B   0690
      ALPHA(K+1)=PI02                                                    B   0700
      SIGN=1.0                                                           B   0710
      IF (YTEST.LT.0.0) SIGN=-1.0                                        B   0720
      XON(K+1)=XON(K)                                                    B   0730
      YON(K+1)=YON(K)+SIGN*DELSNW                                        B   0740
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)    B   0750
      CAPPA(K+1)=0.0                                                     B   0760
      IF (YTEST.LT.0.0.AND.YON(K+1).LE.YIN(2).OR.YTEST.GT.0.0.AND.YON(K+B   0770
     1 1).GE.YIN(2)) GO TO 55                                            B   0780
      IF (ABS(XON(K+1)-XIN(2)).LE.1.0E-4*DELS.AND.ABS(YON(K+1)-YIN(2)).LB   0790
     1E.1.0E-4*DELS) GO TO 60                                            B   0800
      K=K+1                                                              B   0810
      GO TO 50                                                           B   0820
   55 IF (ABS(XON(K+1)-XIN(2)).LE.1.0E-3*DELS.AND.ABS(YON(K+1)-YIN(2)).LB   0830
     1E.1.0E-3*DELS) GO TO 60                                            B   0840
      K=K-1                                                              B   0850
   60 K=K+1                                                              B   0860
      DO 65 KAL=KFIRST,K                                                 B   0870
   65 ALPHA(KAL)=ALPHA(KAL)/PI0180                                       B   0880
      RETURN                                                             B   0890
      END                                                                B   0900
```

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```
      SUBROUTINE FNSTRH (K)
C
C     FINAL STRAIGHT SEGMENT ON THE HUB AND SHROUD
C
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /FORBSS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /FNST/ NFIRST
      NFIRST=K
      DS=DELS1
      DELSTR=DELSMX
      YTEST=YIN(2)-YIN(1)
      XTEST=XIN(2)-XIN(1)
      ASIGN=1.0
      IF (XTEST.LT.0.0) ASIGN=-1.0
      ISTAR=0
      SSEG=SQRT(XTEST**2+YTEST**2)
      IF (XTEST.EQ.0.0) GO TO 10
      IF (YTEST.EQ.0.0) GO TO 15
      DYDXC=YTEST/XTEST
      ALPHAC=ATAN(YTEST/XTEST)
      SINAL=SIN(ALPHAC)
      COSAL=COS(ALPHAC)
      GO TO 20
   10 DYDXC=SIGN(99999.,YTEST)
      ALPHAC=SIGN(PIO2,YTEST)
      SINAL=1.0
      COSAL=0.0
      GO TO 20
   15 DYDXC=0.0
      ALPHAC=0.0
      SINAL=0.0
      COSAL=1.0
   20 DYDXO(K+1)=DYDXC
      ALPHA(K+1)=ALPHAC
      IF (DS.GT.DELSMX) GO TO 25
      GO TO 45
   25 IF (ISTAR.NE.0) GO TO 45
      DSLAST=DS
      XON(K+1)=XON(K)
      YON(K+1)=YON(K)
      ICOUNT=0
   30 XSAVE=XON(K+1)-XIN(1)
      YSAVE=YON(K+1)-YIN(1)
      SSTAR=SQRT(XSAVE**2+YSAVE**2)
      ASTAR=(SSEG-SSTAR)/DELSTR
      ATEST=ASTAR-FLOAT(IFIX(ASTAR))
      IF (ATEST.GT..5) ASTAR=ASTAR+1.0
      NSTAR=IFIX(ASTAR)
      ISTAR=1
      IF (NSTAR.EQ.0) GO TO 35
      DS=(SSEG-SSTAR)/FLOAT(NSTAR)
      IF (DS.GT.DSLAST) GO TO 35
      IF (ICOUNT.GT.0) K=K+1
      GO TO 45
   35 K=K-1
      IF (K.GT.NFIRST) GO TO 40
      K=NFIRST
      CALL STRAIT (K,0)
      K=K-1
      GO TO 50
```

```
40 DSLAST=SQRT((XON(K-1)-XON(K))**2+(YON(K-1)-YON(K))**2)*1.2
   DELSTR=DSLAST
   ICOUNT=ICOUNT+1
   GO TO 30
45 XON(K+1)=XON(K)+ASIGN*DS*COSAL
   YON(K+1)=YON(K)+ASIGN*DS*SINAL
   SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
   CAPPA(K+1)=0.0
   IF (APS(XON(K+1)-XIN(2)).LE..001*DS.AND.XTEST.NE.0.0) GO TO 50
   IF (APS(YON(K+1)-YIN(2)).LE..001*DS.AND.XTEST.EQ.0.0) GO TO 50
C
C((((((   IS THE CURRENT POINT PAST THE NEAREST ENDPOINT OF SEGMENT  (PRE
C(((((( VIOUS TESTS WERE ONLY FOR ABSOLUTE PROXIMITY TO ENDPOINT)
   IF (ABS(YON(K+1)-YIN(1)).GT.ABS(YTEST))GOTO50
   IF (ABS(XON(K+1)-XIN(1)).GT.ABS(XTEST))GOTO50
   K=K+1
   IF (ISTAR.EQ.0) DS=DS*1.2
   GO TO 20
50 DELS1=DELS
   XON(K+1)=XIN(2)
   YON(K+1)=YIN(2)
   NPDY1=K+1
   K=K+1
   DO 55 KAL=NFIRST,K
55 ALPHA(KAL)=ALPHA(KAL)/PI0180
   RETURN
   END
```

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```
      SUBROUTINE FRSTSH (K)
C
C     FIRST STRAIGHT SEGMENT SHROUD
C
C     IF THERE IS NO HUB INTERCHANGE POINTS (X1,Y1) AND (X2,Y2)
C            AND TREAT LIKE FINAL STRAIGHT SECTION ON THE HUB,
C            THEN REVERSE XON AND YON APRAYS
C
C
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB,DELNEW
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /FNST/ NFIRST
      DIMENSION XA(2), YA(2), DSV(500), ASV(500), XSV(500), YSV(500), SS
     1V(500)
      SON(K)=0.0
      IF (IHUB.EQ.1.AND.DELNEW.EQ.0.) GOTO25
      DO 10 I=1,2
      XA(I)=XIN(I)
   10 YA(I)=YIN(I)
      XIN(1)=XA(2)
      XIN(2)=XA(1)
      YIN(1)=YA(2)
      YIN(2)=YA(1)
      NFB2=K
      YON(K)=YIN(1)
      XON(K)=XIN(1)
      CALL FNSTRH (K)
      KSV=K
      KTOT=KSV-NFB2+1
      DO 15 I1=1,KTOT
      I=NFB2+I1-1
      KSR=KSV+1-I1
      DSV(KSR)=DYDXO(I)
      ASV(KSR)=ALPHA(I)
      XSV(KSR)=XON(I)
      YSV(KSR)=YON(I)
   15 SSV(I)  =SON(I)
      DO 20 I=NFB2,KSV
      DYDXO(I)=DSV(I)
      ALPHA(I)=ASV(I)
```

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```
      XON(I)=XSV(I)
      YON(I)=YSV(I)
      SON(I)=SSV(KSV)-SSV(KSV+1-I)
      CAPPA(I)=0.0
   20 CONTINUE
      DELS1=ABS(SON(KSV)-SON(KSV-1))
      RETURN
C
C     IF THERE IS A HUB, USE X VALUES FROM FINAL STRAIGHT
C         SECTION ON THE HUB FOR FIRST STRAIGHT SECTION ON
C            SHROUD
C
   25 XTEST=XIN(1)-XIN(2)
      YTEST=YIN(1)-YIN(2)
      IF (XTEST.EQ.0.0) GO TO 30
      DYDXC=YTEST/XTEST
      ALPHAC=ATAN2(YTEST,XTEST)
      GO TO 35
   30 DYDXC=99999.
      ALPHAC=PI02
   35 K=K-1
      NBDC=NBDY1
      IF (TYPBDY.EQ.3.0.AND.NBDYS.EQ.3) NBDC=NBODY2
      DO 50 I=NFIRST,NBDC
      KEEP=NBDC+NFIRST-I
      XON(K+1)=XON(KEEP)
      DYDXO(K+1)=DYDXC
      ALPHA(K+1)=ALPHAC
      IF (I.EQ.NFIRST) GO TO 40
      YON(K+1)=YON(K)+(XON(K+1)-XON(K))*DYDXC
      IF(COS(ALPHAC).EQ.0.) WRITE(6,44)
      IF(COS(ALPHAC).EQ.0.) STOP
44    FORMAT( 53HOVERTICAL LINE NOT PERMITTED AS FIRST SEGMENT ON BODY )
      SON(K+1)=SON(K)+(XON(K)-XON(K+1))/COS(ALPHAC)
      GO TO 45
   40 YON(K+1)=YIN(1)+(XON(K+1)-XIN(1))*DYDXC
   45 CAPPA(K+1)=0.0
      ALPHA(K+1)=ALPHA(K+1)/PI018D
      K=K+1
   50 CONTINUE
      DELS1=SON(K)-SON(K-1)
      RETURN
      END
```

GS

```
      SUBROUTINE TEST (IA)
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PI02,DELS1,IHUB
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PI0180
      COMMON /SPREP/ KPREP
      M=IA-1
      IF (XIN(2).EQ.XIN(1)) GO TO 10
      SLP1=(YIN(2)-YIN(1))/(XIN(2)-XIN(1))
      GO TO 15
   10 TEST1=(YIN(2)-YIN(1))/(XIN(M)-XIN(1))
      SLP1=SIGN(99999.,TEST1)
   15 IF ((XIN(1).LT.XIN(M).AND.XIN(1).LE.XIN(2)).OR.(XIN(1).GE.XIN(2).A
     1ND.XIN(1).GT.XIN(M))) GO TO 20
      TIP=XIN(1)-XIN(2)
      XIN(1)=XIN(1)+SIGN(50.,TIP)
                                                      YIN(1)=(YIN(2)-YIN(1))*
     1(XIN(1)-XIN(2))/(XIN(2)-XIN(1)+SIGN(50.,TIP))+YIN(2)
   20 SLP2=(YIN(M)-YIN(1))/(XIN(M)-XIN(1))
C
C     ROTATION ONLY
C
   25 IF (SLP1.GT.SLP2) RETURN
C



C     MIRROR INTO XIN(1)
C
   30 CALL PRELPS (2,0,IA,1,1)
      RETURN
      END
```

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```
      SUBROUTINE PRELPS (KODE,KAT,IA,K1,K2)
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,1HUF
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(50
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SPREP/ KPREP
      KPREP=1
      IL=IA
      IF (KAT.EQ.1) GO TO 60
      KID=KODE
      X1=XIN(1)
      Y1=YIN(1)
      IF (IA.EQ.5) GO TO 10
      XC=XIN(4)
      YC=YIN(4)
      GO TO 15
   10 XC=XIN(5)
      YC=YIN(5)
      IL=IA+1
   15 DO 45 IB=1,IL
      IF (IB.NE.6) GO TO 20
      IF (ABS(XIN(6))+ABS(YIN(6)).LE.1.E-15.OR.YIN(6).EQ.200.) GO TO 45
      IF (YIN(6).NE.-100.) GO TO 20
      YIN(6)=-XIN(6)
      GO TO 45
   20 GO TO (25,30,35,40,30,40),KODE
   25 YIN(IB)=YIN(IA)-(YIN(IB)-YIN(IA))
      GO TO 45
   30 XIN(IB)=XIN(1)-(XIN(IB)-XIN(1))
      GO TO 45
   35 YIN(IB)=YIN(1)-(YIN(IB)-YIN(1))
      GO TO 45
   40 XIN(IB)=XIN(IA)-(XIN(IB)-XIN(IA))
   45 CONTINUE
      IF (KODE.EQ.5) GO TO 50
      IF (KODE.EQ.6) GO TO 55
      RETURN
   50 KODE=1
      GO TO 15
   55 KODE=3
      GO TO 15
   60 DO 90 IB=K1,K2
      GO TO (65,70,75,80,65,75),KID
   65 YON(IB)=YC-(YON(IB)-YC)
      GO TO 85
   70 XON(IB)=X1-(XON(IB)-X1)
      GO TO 85
   75 YON(IB)=Y1-(YON(IB)-Y1)
      GO TO 85
   80 XON(IB)=XC-(XON(IB)-XC)
   85 DYDXO(IB)=-DYDXO(IB)
   90 CONTINUE
      IF (KID.EQ.5) GO TO 95
      IF (KID.EQ.6) GO TO 100
      RETURN
   95 KID=2
      GO TO 60
  100 KID=4
      GO TO 60
      END
```

```
      SUBROUTINE ELIPSE (K)
C
C     THIS SUBROUTINE FITS A SEGMENT OF AN ELLIPSE TO TWO ARBITRARILY
C                ORIENTED STRAIGHT LINES NOT MORE THAN 90 DEGREES APART
C
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PI02,DELS1,IHUB
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PI0180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
C
C     TRANSLATE INPUT BREAK POINTS SO THAT POINT NO. 2 BECOMES
C        THE ORIGIN
C
      DELSIN=DELS1
      KOUNT=0
      DELS=DELS1
      PI=3.141592653
      K=K-1
      KSTART=K
      X2=XIN(2)
      Y2=YIN(2)
      DO 10 I=1,4
      XIN(I)=XIN(I)-X2
   10 YIN(I)=YIN(I)-Y2
C
C     ROTATE THE TRANSLATED BREAK POINTS SO THAT THE SLOPE OF THE
C        FIRST STRAIGHT LINE IS ZERO
C
      IF (XIN(2).NE.XIN(1)) GO TO 15
      SLOPE=99999.
      PHI=-PI02
      IF (YIN(1).GT.YIN(2)) PHI=PI02
      GO TO 20
   15 SLOPE=(YIN(2)-YIN(1))/(XIN(2)-XIN(1))
      PHI=ATAN(SLOPE)
      IF (XIN(1).LT.XIN(2)) PHI=PI+ATAN(SLOPE)
   20 DO 25 I=1,4
      XA=XIN(I)
      XIN(I)=XA*COS(PHI)+YIN(I)*SIN(PHI)
   25 YIN(I)=-XA*SIN(PHI)+YIN(I)*COS(PHI)
C
C     DETERMINE THE ELLIPSE
C
      IF (XIN(4).NE.XIN(3)) GO TO 30
      B=YIN(3)
      A=ABS(XIN(3))
      PHIAB=PI02
      GO TO 35
   30 SLOP2=(YIN(4)-YIN(3))/(XIN(4)-XIN(3))
      IF (SLOP2.LE.2.0*YIN(3)/XIN(3)) GO TO 135
      C3=XIN(3)*SLOP2/YIN(3)
      PHIAB=2.0*ATAN(SQRT((C3-2.0)/C3))
      A=-XIN(3)/SIN(PHIAB)
      B=YIN(3)/(1.0-COS(PHIAB))
   35 THETMX=PHIAB-PI02
      THTMXD=THETMX/PI0180
      WRITE (6,140)A,B,XIN(1),YIN(1),PHI,THTMXD
C
C     INITIALIZE THE FIRST POINT ON THE ELLIPSE
C
```

```
   40 K=KSTART
      XON(K+1)=XIN(2)
      YON(K+1)=YIN(2)
      CAPPA(K+1)=-B/(A**2)
      ALPHA(K+1)=0.0
      DYDXO(K+1)=0.0
      KOUNT=KOUNT+1
      THET=-PIO2
      DSSAVE=DELS
      DS=DELS/(1.0+.2*TANH(ABS(CAPPA(I))))
      DTHET=DS/ABS(A)
      THET=THET+DTHET
C
C     GENERATE THE POINTS ON THE ELLIPSE
C
   45 K=K+1
   50 XON(K+1)=-A*COS(THET)
      YON(K+1)=B*(1.0+SIN(THET))
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
      IF (ABS(SON(K+1)-SON(K)).GT.1.05*DS) GO TO 55
      IF (ABS(SON(K+1)-SON(K)).LT..95*DS) GO TO 60
      GO TO 65
   55 THET=THET-.02*DTHET
      GO TO 50
   60 THET=THET+.02*DTHET
      GO TO 50
   65 IF (THET.EQ.0.0) GO TO 70
      DYDXO(K+1)=B*COTAN(THET)/A
      ALPHA(K+1)=ATAN(DYDXO(K+1))
      GO TO 75
   70 DYDXO(K+1)=99999.
      ALPHA(K+1)=PIO2
   75 CAPPA(K+1)=-A*B/(B*B*COS(THET)**2+A*A*SIN(THET)**2)**1.5
      DS=DELS/(1.0+.2*TANH(ABS(CAPPA(I))))
      IF (ABS(DS-DELS).GT..20*DELS) DS=DELS+SIGN(.20*DELS,DS-DELS)
      DSSAVE=DS
   80 DTHET=DS/SQRT(B*B*COS(THET)**2+A*A*SIN(THET)**2)
      DTS=DTHET
      THET=THET+DTHET/2.0
      DTHET=DS/SQRT(B*B*COS(THET)**2+A*A*SIN(THET)**2)
      IF (ABS(DTHET-DTS).LT..001*DTS) GO TO 85
      GO TO 80
   85 IF (THET.LE.THETMX-DTHET/2.0) GO TO 45
      IF (KOUNT.GT.100) GO TO 115
      DELSS=DELS
      DSTEST=((XON(K+1)-XIN(3))**2+(YON(K+1)-YIN(3))**2)**.5
      IF (ABS(DS-DSTEST).LT..01*DS) GO TO 90
      IF (DSTEST.GT.DS) GO TO 110
      IF (DSTEST.LT..01*DS) GO TO 95
      IF (DSTEST-.5*DS) 105,90,100
   90 K=K+1
   95 XON(K+1)=XIN(3)
      YON(K+1)=YIN(3)
      GO TO 115
  100 DELS=(FLOAT(K+1-KSTART)*DELS+DSTEST)/FLOAT(K+2-KSTART)
      IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
      GO TO 40
```

```
  105 DELS=DELS+DSTEST/FLOAT(K+2-KSTART)
      IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
      GO TO 40
  110 DELS=.8*DELS
      GO TO 40
  115 DELS1=DS*1.2
      IF (DELS1.GT.DELS) DELS1=DELS
      WRITE (6,145)KOUNT
      WRITE (6,155)DELSIN,DELS,DELS1,DSTEST
      KEND=K+1
      KSTART=KSTART+1
C
C     ROTATE AND TRANSLATE BACK
C
      DO 130 KROT=KSTART,KEND
      XA=XON(KROT)
      XON(KROT)=XA*COS(PHI)-YON(KROT)*SIN(PHI)+X2
      YON(KROT)=XA*SIN(PHI)+YON(KROT)*COS(PHI)+Y2
      ALPHA(KROT)=ALPHA(KROT)+PHI
      IF (ALPHA(KROT).EQ.PIO2) GO TO 120
      DYDXO(KROT)=TAN(ALPHA(KROT))
      GO TO 125
  120 DYDXO(KROT)=99999.
  125 ALPHA(KROT)=ALPHA(KROT)/PIO180
  130 CONTINUE
      RETURN
  135 WRITE (6,150)SLOP2,YIN(3),YIN(3)
      STOP
C
C
  140 FORMAT (1H0,10X,4HA  =,1PE10.3,5X,4HB = ,1PE10.3,5X,5HX0 = ,1PE10.
     13,5X,7HY0    = ,1PE10.3/9X,7HPHI  = ,1PE10.3,5X,9HTHETPX = ,1PE10.3
     2)
  145 FORMAT (11X,I3,2X,13HITERATIONS---)
  150 FORMAT (1H0,10X,42HCOMBINATION OF SLOPE, X , Y NOT COMPATIBLE/5X,9
     1HSLOPE2 = ,F7.3,3X,9HXIN(3) = ,F7.3,3X,9HYIN(3) = ,F7.3)
  155 FORMAT (11X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT = 
     1,F8.5,3X,9HDSTEST = ,F8.5)
      END
```

```
      SUBROUTINE SUPERC (XBRK,YBRK,ENREED,DELS1,ISTART)                 H    C000
      DIMENSION ENREED(2)                                               H    C010
      DIMENSION XBRK(6), YBRK(6), XBK1(13), YBK1(13)                    H    C020
      REAL LOGXOA,LOGYOB                                                H    C030
      COMMON /SUPF/ IFLD                                                H    C040
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500H    C050
     1),ALPHA(500),CAPPA(500),SON(500),PIO180                           H    C060
      COMMON/SUPN/ XOA(2),YOB(2),LOGXOA(2),LOGYOB(2)                    H    C070
      COMMON /NHIGH/ NSPHG,NLAST,XLAST(500),YLAST(500)                  H    C080
      COMMON/SENSE/ X8(2),Y8(2),A,B,INFLEC                              H    C090
      COMMON /SPREP/ KPPEP                                              H    C100
      COMMON/PAC/ PACE,DELSHL                                           H    C110
      COMMON/TRYFIT/KOUNT                                               H    C120
      IPI=0                                                             H    C130
      PI=3.14159265                                                     H    C140
      IF (IFLD.EQ.1) DELSHL=DELS1                                       H    C150
      DELSIM=DELS1                                                      H    C160
      DELS2=DELS1                                                       H    C170
      KOUNT=0                                                           H    C180
   10 II=ISTART                                                         H    C190
      IF (IFLD.GE.1) DS=DELS2                                           H    C200
      KOUNT=KOUNT+1                                                     H    C210
      I=ISTART                                                          H    C220
      X4T=XBRK(4)                                                       H    C230
      Y4T=YBRK(4)                                                       H    C240
C(((((( FOR SUBSEQUENT ITERATIONS, SKIP LL INITIALIZATION.              H    C250
      IF ((LL.GE.5.OR.LL.LT.-5).AND.KOUNT.NE.1) GO TO 50                H    C260
      LL=0                                                              H    C270
C((((((  FLAG FOR ENDPT. CURVATURE MATCH IS YBRK(6)=200.                H    C280
```

```
      IF (YBRK(6)-200.) 40,15,40
   15 CAP=-ABS(XBRK(6))
      LL=-8
      IF (XBRK(6).NE.999.) GO TO 50
      IF (XBRK(3).NE.XBRK(2)) GO TO 20
C(((((( IF THE PT. WHERE  CURVATURES MUST MATCH HAS INFIN. SLOPE,
C(((((( OBTAIN CURVATURE FROM PREVIOUS SEGMENT'S EXPONENTS.
      IF (XBRK(2).NE.XBRK(1)) GO TO 25
      LL=-8
      CAP=-2.*A/X8(1)/B/B
      GO TO 50
   20 IF (XBRK(5).NE.XBRK(4)) GO TO 25
      LL=-8
      CAP=-2.*A/X8(1)/B/B
      GO TO 50
   25 IF(XBRK(6).EQ.999.)XBRK(6)=  CAPPA(ISTART)
      IF (XBRK(6).EQ.0..OR.ABS(XBRK(6)).GE.99999.) GO TO 30
      CAP=-ABS(XBRK(6))
      GO TO 50
   30 WRITE (6,35)
   35 FORMAT(1H0,3X,99HREQUEST FOR SPECIFIC CURVATURE MUST BE MODIFIED O
     1R WITHDRAWN. DESIRED CURVATURE CAN'T=0. OR INFINTY)
      STOP
C((((((    POINT-PLUS-SLOPE FLAG IS    YBRK(6)= -100.
   40 IF (YBRK(6)+100.) 50,45,50
   45 LL= 5
C(((((( ADDITIONAL FLAG FOR INFLECTION-POINT-PLUS-SLOPE IS  YBRK(3)= 100
      IF(YBRK(3).EQ.100.) LL=6
C((((((FOR INITIAL GUESS OF UNKNOWN Y AT INFLECTION POINT,USE ENDPT. AVG.
      IF(LL.EQ.6) YBRK(3)= YBRK(2)+(XBRK(2)-XBRK(3))/(XBRK(2)-XBRK(4))*(
     1YBRK(4)-YBRK(2))
C(((((( CREATE A DUMMY POINT TO SIMULATE THE GIVEN SLOPE THROUGH
C   (XBRK(3),YBRK(3))
      YBRK(6)= XBRK(6)*((XBRK(3)+5.)-XBRK(3)) +YBRK(3)
      XBRK(6)= XBRK(3)+5.
   50 DO 55 J=1,6
      XBK1(J+7)=XBRK(J)
      YBK1(J+7)=YBRK(J)
   55 CONTINUE
      IF (XBK1(9).NE.XBK1(8)) GO TO 65
      IF (YBK1(8).LT.YBK1(9)) GO TO 60
      SLOP=99999.
      SINATD=1.0
      SLOPE=99999.
      ATDYDD=90.
      COSATD=0.0
      GO TO 80
   60 SLOP=-99999.
      SINATD=-1.0
      SLOPE=-99999.
      ATDYDD=-90.
      COSATD=0.0
      GO TO 80
   65 SLOP=(YBK1(9)-YBK1(8))/(XBK1(9)-XBK1(8))
      SLOPE=ATAN(SLOP)
      ATDYDD=SLOPE/PIO180
      IF (XBK1(8)-XBK1(9)) 70,75,75
```

```
70 SLOPE=PI+SLOPE
   ATDYDD=-ATDYDD
   IPI=1
75 SINATD=SIN(SLOPE)
   COSATD=COS(SLOPE)
80 CONTINUE
   INFLEC = ABS(INT(SINATD))
   XBK(8)=XBK1(8)
   YBK(8)=YBK1(8)
   DO 85 J=9,13
   XP=XBK1(J)-XBK1(8)
   YP=YBK1(J)-YBK1(8)
   XBK(J)=XBK1(8)+XP*COSATD+YP*SINATD
   YBK(J)=YBK1(8)-XP*SINATD+YP*COSATD
85 CONTINUE
   Q=1.
   P=1.
   XBK(5)=XBK(8)

   YBK(5)=YBK(8)
   XBK(6)=XBK(9)
   YBK(6)=YBK(9)
   XBK(9)=XBK(13)
   YBK(9)=YBK(13)
   DELS=DELS1
   DSSAVE=DELS
   XTH=XBK1(9)
   YTH=YBK1(9)

   B=YBK(11)-YBK(6)
   TOMEGA=(XBK(12)-XBK(11))/(YBK(12)-YBK(11))
   IF (ABS(TOMEGA).LE..0001) TOMEGA=0.
   OMEGA=ATAN(TOMEGA)
   XC=XBK(6)+B*TOMEGA
   YC=YBK(11)
   A=XC-XBK(11)
   XI9=XC-XBK(9)
   ETA9=YC-YBK(9)
   Y8(1)=ETA9
   X8(1)=XI9-ETA9*TOMEGA
   X8(2)=XC-XBK(13)-TOMEGA*(YC-YBK(13))
   Y8(2)=YC-YBK(13)
   BOA=B/A
   IF (LL.GE.5) GO TO 90
   IF (LL.LE.-5) GO TO 105
   LL=0
   IF(ENREED(1).GT.0.) P=ENREED(1)
   IF(ENREED(2).GT.0.) Q=ENREED(2)
   IF(P.EQ.1.) LL=1
   IF(Q.EQ.1.) LL=LL+2
   IF (LL.EQ.0) GO TO 115
90 XOA(1)=X8(1)/A
   YOB(1)=Y8(1)/B
   LOGXOA(1)=ALOG(XOA(1))
   LOGYOB(1)=ALOG(YOB(1))
   IF (XBK(6).EQ.0..AND.LL.EQ.3) GO TO 95
   IF (LL.NE.3) GO TO 100
```

```
      XOA(2)=XB(2)/A
      YOB(2)=YB(2)/B
      LOGXOA(2)=ALOG(XOA(2))
      LOGYOB(2)=ALOG(YOB(2))
      GO TO 100
   95 LL=4
  100 CALL FONISO(P,Q,LL)
      GO TO 115
C((((((  FOR CURVATURE MATCH, NO ITERATION REQD. BUT ONE EXPONENT MUST=2
  105 IF(XBRK(3).EQ.XBRK(2))P=2.
      IF(XBRK(3).EQ.XBRK(4))Q=2.
C(((((( OBTAIN OTHER EXPONENT FROM ENDPOINT CURVATURE RELATION
  110 IF(P .EQ. 2.)  Q= -2.*B/CAP/A/A
      IF(Q .EQ. 2. .AND. P .NE. 2.)  P=-2.*A/CAP/B/B
  115 IF (KOUNT.NE.1) GO TO 120
      WRITE (6,475)P,A,XO,Q,B,YO,OMEGA
  120 I=I
      ILO=I
      XON(I)=XON(I1)
      CION=1./P
      PT=B*TOMEGA
      DX1=DELS*COSATD
      XP=XTM-XBK1(8)
      YP=YTM-YBK1(8)
      XI1ROT=XBK1(8)+XP*COSATD+YP*SINATD
      XI=XC-XI1ROT
      Y=YC-YBK(6)
      X=XI-Y*TOMEGA
      IF (X.LT.0.0) X=0.0
      DSM=SON(I)-SON(I-1)
  125 XOATON=(X/A)**P
      YOBTON=(Y/B)**Q
C((((((  AVOID (.LE. 0.)**(.LE. 0.)
      IF (P.GE.1.) GO TO 135
      IF (X.NE.0.) GO TO 130
      XNMOAN=99999.
      GO TO 140
  130 XNMOAN=(1./Y)**(1.-P)/A**P
      GO TO 140
  135 XNMOAN=X**(P-1.)/A**P
  140 IF (Q.GE.1.) GO TO 150
      IF (Y.NE.0.) GO TO 145
      YNMOBN=9999.
      GO TO 155
  145 YNMOBN=(1./Y)**(1.-Q)/B**Q
      GO TO 155
  150 YNMOBN=Y**(Q-1.)/B**Q
  155 FOFY=XOATON+YOBTON-1.
      IF (ABS(FOFY).LE.1.0E-5) GO TO 160
      FPOFY=Q*YNMOBN-TOMEGA*P*XNMOAN
      YNEW=Y-FOFY/FPOFY
      GO TO 165
  160 YNEW=Y
  165 IF (ABS(Y-YNEW)/YNEW-.1E-4) 175,175,170
  170 Y=YNEW
      X=XI-Y*TOMEGA
      GO TO 125
```

```
  175 Y=YNEW
      X=XI-Y*TOMEGA
  180 ETA=Y
      DELS=DELS2
      IPN=I
      IF (X.LT.0.0) X=0.0
C((((((  AVOID (.LE. 0.)**(.LE. 0.)
      IF (P.GE.1.) GO TO 190
      IF (X.NE.0.) GO TO 185
      XOANM1= 99999.
      GO TO 195
  185 XOANM1=(A/X)**(1.-P)
      GO TO 195
  190 XOANM1=(X/A)**(P-1.)
  195 IF (Q.GE.1.) GO TO 205
      IF (Y.NE.0.) GO TO 200
      YOBNM1= 99999.
      GO TO 210
  200 YOBNM1= (B/Y)**(1.-Q)
      GO TO 210
  205 YOBNM1=(Y/B)**(Q-1.)
  210 F1=(XOANM1/A)*P
      F2=(YOBNM1/B)*Q
      F3=TOMEGA*F1
      IF (X.EQ.0.0) GO TO 225
      IF (P.GE.2.) GO TO 215
      F1OX=P*(1./X)**(2.-P)/A**P
      GO TO 220
  215 F1OX=P*X**(P-2.)/A**P
  220 GO TO 230
  225 IF(P.EQ.2.) F1OX=2.0/(A*A)
      IF(P.GT.2.) F1OX=0.0
  230 IF (Y.EQ.0.0) GO TO 240
      IF (Q.GE.2.) GO TO 235
      F2OY=Q*(1./Y)**(2.-Q)/B**Q
      GO TO 245
  235 F2OY=Q*Y**(Q-2.)/B**Q
      GO TO 245
  240 IF(Q.EQ.2.) F2OY=2./(B*B)
      IF(Q.GT.2.) F2OY=0.
  245 DEN=F2-F3
      IF (DEN.NE.0.0) GO TO 250
      DETDXI=99999.
      GO TO 255
  250 DETDXI=-F1/DEN
  255 DYDXO(IPN)=DETDXI
      C1MEPT=1.-DETDXI*TOMEGA
      IF (IPN.EQ.ISTART.AND.LL.LE.-6) GO TO 260
C((((((  ELIMINATE CASES OF UNDEFINED CURVATURE
      IF (X.EQ.0..AND.P.LT.2.) GO TO 265
      IF (Y.EQ.0..AND.Q.LT.2.) GO TO 265
      G1=(P-1.)*F1OX*C1MEPT
      SAND1=DEN*G1
      SAND2=F1*((Q -1.)*F2OY*DETDXI-G1*TOMEGA)
      IF(ABS(DETDXI).GT.1.E 11) DETDXI=1.E 11
      BKT=(1.+DETDXI**2)**1.5
      CAPPA(IPN)=(SAND2-SAND1)/DEN**2/BKT
```

```
      IF(P.EQ.2..AND.X.EQ.0.)CAPPA(IPN)=-2.*B/Q/A/A
      IF(Q.EQ.2..AND.ABS(Y).LT.1.E-4)CAPPA(IPN)=-2.*A/P/P/B
      GO TO 270
  260 IF(P.EQ.2.)CAPPA(IPN)=-2.*B/Q/A/A
      IF(Q.EQ.2.)CAPPA(IPN)=-2.*A/P/B/B
      GO TO 270
  265 CAPPA(IPN)=99999.
  270 ALPHA(IPN)=ATAN(DYDXO(IPN))/PIO180
      XON(IPN)=XO-XI
      YON(IPN)=YO-ETA
      DYI=DELS*SINATD
      IF (IFLD.GE.1) GO TO 275
      DS=DELS/(1.0+.20*TANH(ABS(CAPPA(I))))
      GO TO 285
  275 IF (IFLD.GT.1.AND.(IPN-ISTART).GT.3) GO TO 280
      DS=DS-PACE*DS
      GO TO 290
  280 DS=DS+1.5*PACE*DS
      IF (DS.GT.DELSHL) DS=DELSHL
      GO TO 290
  285 IF (ABS(DS-DELS).GT..20*DELS) DS=DELS+SIGN(.20*DELS,DS-DELS)
  290 IF (DS.LT..02*DELS2) DS=.02*DELS2
      IF (IFLD.GT.0.AND.(I-ISTART).GT.200) GO TO 410
      IF (NSPHG.EQ.0) GO TO 295
      DX1=ABS(XLAST(NLAST)-XLAST(NLAST-1))
      DX11=DX1
      DY1=ABS(YLAST(NLAST)-YLAST(NLAST-1))
      NLAST=NLAST-1
  295 IF (ABS(DETDXI)-1.) 320,320,300
  300 DY1=DS/SQRT(1.+1./DETDXI**2)
      IF (NSPHG.NE.0) DY1=DX1
  305 YTM=YON(I)+DY1
      IF (YTM-YBK(11)) 310,390,390
  310 ETA=YO-YTM
      Y=ETA
C
C     STRAIGHT SECTION BETWEEN POINTS 11 AND 12 MUST HAVE SLOPE ABOVE 1
C
C
C     X MAY NOT BE TESTED AGAINST XBK(11)
C
      X=A*(1.-(Y/B)**Q)**C1ON
      XI=X+Y*TOMEGA
      XTM=XO-XI
      DX1=XTM-XON(I)
      DELTAS=SQRT(DY1**2+DX1**2)
      IF (DELTAS.GT.1.02*DS.AND.IPN.NE.1.AND.NSPHG.EQ.0) GO TO 315
      GO TO 390
  315 DY1=DS*DY1/DELTAS
      GO TO 305
  320 DX1=DS/SQRT(1.+DETDXI**2)
      IF (NSPHG.NE.0) DX1=DY1
      IF (NSPHG.NE.0.AND.IPI.EQ.1) DX1=DX11
  325 XTM=XON(I)+SIGN(DX1,DETDXI)
      IF (DETDXI.EQ.0.) XTM=XON(I)-DX1
      XI=XO-XTM
      Y=YO-YON(I)
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```
  330 X=XI-Y*TOMEGA
      IF (X.LT.0.0) X=0.0
      XOATON=(X/A)**P
      YOBTON=(Y/B)**Q
C((((((  AVOID (.LE. 0.)**(.LE. 0.)
      IF (P.GE.1.) GO TO 340
      IF (X.NE.0.) GO TO 335
      XNMOAN=99999.
      GO TO 345
  335 XNMOAN=(1./X)**(1.-P)/A**P
      GO TO 345
  340 XNMOAN=X**(P-1.)/A**P
  345 IF (Q.GE.1.) GO TO 355
      IF (Y.NE.0.) GO TO 350
      YNMOBN=9999.
      GO TO 360
  350 YNMOBN=(1./Y)**(1.-Q)/B**Q
      GO TO 360
  355 YNMOBN=Y**(Q-1.)/B**Q
  360 FOFY=XOATON+YOBTON-1.
      IF (ABS(FOFY).LE.1.0E-5) GO TO 365
      FPOFY=Q*YNMOBN-TOMEGA*P*XNMOAN
      YNEW=Y-FOFY/FPOFY
      GO TO 370
  365 YNEW=Y
  370 IF (ABS(Y-YNEW)/YNEW-.1E-4) 380,380,375
  375 Y=YNEW
      GO TO 330
  380 Y=YNEW
      X=XI-Y*TOMEGA
      YTM=YC-Y
      XI=X+Y*TOMEGA
C     DY1=YTM-YON(I-1)
      DY1=YTM-YON(I)
      DELTAS=SQRT(DY1**2+DX1**2)
      IF (DELTAS.GT.1.02*DS.AND.IPN.NE.1.AND.NSPHG.EQ.2) GO TO 385
      GO TO 390
  385 DX1=DS*DX1/DELTAS
      GO TO 325
  390 SON(I)=SON(I-1)+DSM
      DSM=DS
      IF (NSPHG.NE.2) DS=DX1
      IF (ABS(YTM-YBK(11)).LT..001*DS) GO TO 400
      I=I+1
      IF (YTM-YBK(11)) 180,395,395
  395 IHI=I-1
      GO TO 405
  400 IHI=I
      I=I+1
  405 XTM=XBK(11)
      IIHI=IHI
  410 IF (IFLD.LE.0.OR.(I-ISTART).LT.200) GO TO 415
      IF(IFLD.EQ.1)                         PACE=PACE-.25*PACE
      IF(IFLD.EQ.2)                         PACE=PACE+.25*PACE
      I=ILO-1
      GO TO 10
  415 DO 455 J=ILO,IHI
```

```
      XP=XON(J)-XBK1(8)
      YP=YON(J)-YBK1(8)
      XON(J)=XBK1(8)+XP*COSATD-YP*SINATD
      YON(J)=YBK1(8)+XP*SINATD+YP*COSATD
      DEL22=DELS2
      IF (J.NE.IHI) GO TO 445
      DSTEST=((XON(IHI)-X4T)**2+(YON(IHI)-Y4T)**2)**.5
      IF (KOUNT.GT.150) GO TO 445
      IF (ABS(DS-DSTEST).LT..1*DS) GO TO 420
      IF (DSTEST.LT..01*DS) GO TO 425
      IF (IHI.EQ.ILO) GO TO 440
      IF (ABS(DELS2-DSTEST).LT..001*DS) GO TO 435
      IF (DSTEST.LT..5*DS) GO TO 435
      IF (DSTEST.GT..5*DS) GO TO 430
C((((((       VIA BUTTON 1/5/74
  420 IIHI=IIHI+1
      I=J+1
      IONE=IIHI-1
      SON(IIHI)=SON(IONE   )+DSTEST
  425 IIHI=IIHI+1
      IONE=IIHI-1
      XON(IONE   )=X4T
      YON(IONE   )=Y4T
      GO TO 445
  430 IF (IFLD.GT.1) GO TO 435
      DELS2=(FLOAT(IHI-ILO)*DELS2+DSTEST)/FLOAT(IHI+1-ILO)
      IF (KOUNT.GE.10) DELS2=(DELS2+DEL22)/2.0
      I=ILO-1
      GO TO 10
  435 DELS2=DELS2+DSTEST/FLOAT(IHI-ILO)
      IF (KOUNT.GE.10) DELS2=(DELS2+DEL22)/2.0
      IF(IFLD.GT.1.AND.(DS/DEL22).GT.2.)
     1PACE=PACE*(1.+DSTEST/DEL22/(FLOAT(IHI-ILO)*(1.+1.5*PACE)**FLOAT(IHH
     2I-ILO-1)-((1.+1.5*PACE)**FLOAT(IHI-ILO)-1.)/1.5/PACE))
      IF(IFLD.GT.1.AND.(DS/DEL22).GT.2.)DELS2=DEL22
      I=ILO-1
      GO TO 10
  440 DELS2=.8*DELS2
      I=ILO-1
      GO TO 10
  445 ALPHA(J)=ALPHA(J)-ATDYDC
      IF (ABS(ABS(ALPHA(J))-90.).LE.1.0E-4) GO TO 450
      DYDXO(J)=TAN(ALPHA(J)*PIO180)
      GO TO 455
  450 DYDXO(J)=SIGN(999.,ALPHA(J))
  455 CONTINUE
      IHI=IONE
      IF (KOUNT.GT.150) WRITE (6,480)(XPRK(IU8),YPRK(IU8),IU8=1,5)
      DELS1=DS
      IF (IFLD.EQ.0) DELS1=1.1*DS
      IF (DELS1.GT.DELS2.AND.IFLD.LE.1)DELS1=DELS2
      DO 465 J=ILO,IHI
      IF (J.EQ.1) GO TO 460
      SON(J)=SON(J-1)+SQRT((XON(J)-XON(J-1))**2+(YON(J)-YON(J-1))**2)
      GO TO 465
  460 SON(J)=0.0
  465 CONTINUE
```

```
      WRITE (6,485)KOUNT
      WRITE (6,490)DELSIN,DELS2,DELS1,DSTEST
      IF (IFLD.GT.0) WRITE (6,470)PACE
  470 FORMAT(1H+,87X,*FINAL PACE= *,F8.5)
      IC=I
      X8(1)=P
      X8(2)=Q
      XDIF=XBRK(4)-XBRK(5)
      IF(ABS(XDIF).LT.1.E-15)XDIF=SIGN(1.E-15,XDIF)
      DYDXO(IC-1)=(YBRK(4)-YBRK(5))/XDIF
      IF(ABS(DYDXO(IC-1)).GT.99999.)DYDXO(IC-1)=SIGN(99999.,DYDXO(IC-1))
      ALPHA(IC-1)=ATAN(DYDXO(IC-1))/PIO18O
      IF(CAPPA(IC-1).EQ.0..AND.P.EQ.2..AND.Q.EQ.2.)CAPPA(IC-1)=-2.*A/P/5
     1/P
      RETURN
C
C
  475 FORMAT(1X/4X,4HP = ,E16.8,4X,4HA = ,E16.8,7X,5HXC = ,E16.8/4X,4HQ
     1= ,E16.8,4X,4HB = ,E16.8,7X,5HYO = ,E16.8,3X,8HOMEGA = ,E16.8/1X)
  480 FORMAT (1H0,6CHTHIS SET OF DATA EXCEEDED 150ITERATIONS CALCULATION
     1S STOPPED/5X,4HXBRK,5X,4HYBRK/5X,1P10E10.3)
  485 FORMAT (1X,5X,I3,2X,13HITERATIONS---)
  490 FORMAT (6X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT = ,
     1F8.5,3X,9HDSTEST = ,F8.5)
      END
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
      SUBROUTINE FONISO(P,Q,LL)
C((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((
C
C     FOR THE BI-SUPERELLIPSE,  F(P,Q) = (X/A)**P + (Y/B)**Q - 1 = 0.
C
C     IF LL =             AND GIVEN                FIND
C      1                  Q,X1,Y1                  P
C      2                  P,X1,Y1                  Q
C      3                  X1,Y1,X2,Y2              P AND Q
C      4                  X1,Y1                    P = Q = N
C      5                  X1,Y1,SLOPE AT(X1,Y1)    P AND Q
C      6                  (X1, )=INFLECTION PT,    P,Q,AND YI
C                         PLUS SLOPE AT (X1, )
C
      REAL LOGXOA,LOGYOB
      DIMENSION OX(2),OY(2)
      COMMON/TRYFIT/KOUNT
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON/SUPN/ XOA(2),YOB(2),LOGXOA(2),LOGYOB(2)
      COMMON/SENSE/  X(2),Y(2),A,B,INFLEC
      DATA TOL/.1E-6/
      YI=Y(1)
      XI=X(1)
      OX(1)= XIN(3)
      OX(2)=XIN(6)
      OY(1)= YIN(3)
      OY(2)=YIN(6)
      DO 20 I=1,2
      IF (KOUNT.GT.1) GO TO 20
      IF (I.EQ.2.AND.LL.NE.3) GO TO 20
      OA= XOA(I)
      OB= YOB(I)
      IF ((OB+OA).LE.1.0) GO TO 10
      IF (OB.GE.1.0.OR.OA.GE.1.0) GO TO 15
      GO TO 20
   10 WRITE (6,90)OX(I),OY(I)
      GO TO 20
   15 WRITE (6,85)OX(I),OY(I)
      STOP
   20 CONTINUE
      IF (LL.NE.6) GO TO 25
      P=1.5
      Q=.5
   25 IF (LL.NE.6) GO TO 30
      YOB(1)= Y(1)/B
      LOGYOB(1)=ALOG(YOB(1))
      XOA(1)=X(1)/A
      LOGXOA(1)=ALOG(XOA(1))
   30 XOATP1= XOA(1)**P
      YOBTQ1= YOB(1)**Q
      DFDPA1= XOATP1*LOGXOA(1)
      F1= XOATP1 + YOBTQ1 -1.
      DFDQA1 = YOBTQ1*LOGYOB(1)
      GO TO (55,60,35,65,70,70),LL
   35 XOATP2 = XOA(2)**P
      YOBTQ2 = YOB(2)**Q
      DFDQA2 = YOBTQ2 * LOGYOB(2)
      F2 = XOATP2 + YOBTQ2 - 1.
      DFDPA2 = XOATP2*LOGXOA(2)
   40 QN = (F1*DFDPA2/(DFDQA2*DFDPA1)-F2/DFDQA2)/(1. - DFDPA2*DFDQA1/(DF
     1DPA1*DFDQA2))  + Q
      PN =((Q-QN)*DFDQA1 -F1)/DFDPA1 +  P
   45 TESTP=ABS(PN-P)/P -TOL
      TESTQ=ABS(QN-Q)/Q -TOL
      Q=QN
```

```
      P=PN
      IF (TESTP.GT.0..OR.TESTQ.GT.0.) GO TO 25
   50 RETURN
   55 PN= -F1/DFDPA1 + P
      TESTP=ABS(PN-P)/P -TOL
      P=PN
      IF (TESTP) 50,25,25
   60 QN= -F1/DFDQA1 +Q
      TESTQ=ABS(QN-Q)/Q -TOL
      Q=QN
      IF (TESTQ) 50,25,25
   65 DFDQA1= YOBTQ1*LOGYOB(1)
      PN=-F1/(DFDPA1+DFDQA1) +P
      TESTP= ABS(PN-P)/P -TOL
      P=PN
      Q=P
      IF (TESTP) 50,25,25
   70 DYDX= (Y(2)-YI   )/(X(2)-XI   )
      F2=DYDX+   P*XOATP1*Y(1)/Q/YOBTQ1/X(1)
      EOCALD= - P*XOATP1*Y(1)/Q/YOBTQ1/X(1)
      DFDQA2=       - (ALOG(B)-1./Q-ALOG(Y(1)))*EOCALD
      DFDPA2=       - (1./P -ALOG(A)+ ALOG(X(1)))*EOCALD
      IF (LL.EQ.6) GO TO 75
      GO TO 40
   75 EOCALD= - P*XOATP1*Y(1)/Q/YOBTQ1/X(1)
      G=F2
      DGDP= DFDPA2
      DGDQ= DFDQA2
      H = EOCALD*((P-1.)/X(1)+((1.-Q)/Y(1))*EOCALD)
      DHDP  = EOCALD*((P-1.)/X(1)+((1.-Q)/Y(1))*EOCALD)*(1./P-ALOG(A)+AL
     1OG(X(1)))+EOCALD*(1./X(1) +((1.-Q)/Y(1))*EOCALD*(1./P-ALOG(A)+ALOG
     2(X(1))))
      DHDQ  = EOCALD*((P-1.)/X(1)+((1.-Q)/Y(1))*EOCALD)*(-1./Q+ALOG(B)-A
     1LOG(Y(1)))+EOCALD*(-EOCALD/Y(1)+((1.-Q)/Y(1))*EOCALD*(-1./Q+ALOG(B
     2)-ALOG(Y(1))))
      DFDY= Q/Y(1)*YOBTQ1
      IF(INFLEC.EQ.1)DFDY=P/X(1)*XOATP1
      DGDY= EOCALD*(Q-1.)/Y(1)
      IF(INFLEC.EQ.1)
     1              DGDY=EOCALD*(1.-P)/X(1)
      EOCAL2=2.*EOCALD
      DHDY= EOCALD*(((P-1.)/X(1)+((1.-Q)/Y(1))*EOCAL2)*(1.-Q)/Y(1)+EOCAL
     1D*(Q-1.)/Y(1)/Y(1))
      IF(INFLEC.EQ.1)
     1              DHDY=EOCALD/X(1)*(P-1.)*((P-2.)/X(1)+2.*EOCALD*(1.-Q)/Y
     1(1))
      WRONSK=DFDPA1*(DGDQ*DHDY-DGDY*DHDQ)-DFDQA1*(DGDP*DHDY-DGDY*DHDP)+
     1DFDY*(DGDP*DHDQ-DGDQ*DHDP)
      QN=Q+(F1*(DGDP*DHDY-DGDY*DHDP)-G*(DFDPA1*DHDY-DFDY*DHDP)+H*(DFDPA1
     1*DGDY-DFDY*DGDP))/WRONSK
      PN=P+(-F1*(DGDQ*DHDY-DGDY*DHDQ)+G*(DFDQA1*DHDY-DFDY*DHDQ)-H*(DFDQA
     11*DGDY-DFDY*DGDQ))/WRONSK
      YN=Y(1)+(DHDP*(P-PN)+DHDQ*(Q-QN)-H)/DHDY
      IF(INFLEC.EQ.1)
     1              YN=X(1)+(DHDP*(P-PN)+DHDQ*(Q-QN)-H)/DHDY
      TESTY=ABS(YN-Y(1))/Y(1) - 1.E-05
      IF(INFLEC.EQ.1)
```

```
     1            TESTY=APS(YN-X(1))/X(1) - 1.E-05
      IF(INFLEC.NE.1 ) Y(1)=YN                                          I
      IF(INFLEC.EQ.1)                                                   I
     1X(1)=YN                                                           I
      IF (TESTY) 45,45,80                                               I
   80 Q=QN                                                              I
      P=PN                                                              I
      GO TO 25                                                          I
   85 FORMAT(1H0,42H THIS POINT IS OUTSIDE THE MAGIC TRIANGLE,,2E15.4/  I
     2                                                              52HI
     1 THIS CONDITION IS NOT VALID FOR ANY CASE. REVISE       )         I
   90 FORMAT(1H0,42H THIS POINT IS BELOW   THE MAGIC TRIANGLE,,2E15.4/52I
     1H THIS CONDITION IS VALID ONLY FOR THE BISUPERELLIPSE/72H WITH INFI
     1LECTION(P OR Q LESS THAN 1.). SUCH A CURVE HAS BEEN GENERATED   ) I
C((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((((I
      END                                                               I
```

```
      SUBROUTINE CUBIC (K)
C
C     FIT A CUBIC BETWEEN 2 STRAIGHT LINES -- RESTRICTION -- THE STRAIGH
C              LINES CANNOT BE VERTICAL
C
      DIMENSION AA(4,4), BB(4)
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PI02,DELS1,IHUB
      COMMON /FOR3SS/I0,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PI0180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      DELSIN=DELS1
      DELS=DELS1
      KOUNT=0
      K=K-1
      KSTART=K
      X2=XIN(2)
      X3=XIN(3)
      Y2=YIN(2)
      Y3=YIN(3)
      SLOP2=(YIN(4)-Y3)/(XIN(4)-X3)
C
C     SETUP  4  X  4   MATRIX OF COEFFICIENTS
C
      AA(1,1)=1.0
      AA(1,2)=X2
      AA(1,3)=X2*X2
      AA(1,4)=X2**3
      AA(2,1)=0.0
      AA(2,2)=1.0
      AA(2,3)=2.0*X2
      AA(2,4)=3.0*X2**2
      AA(3,1)=1.0
      AA(3,2)=X3
      AA(3,3)=X3**2
      AA(3,4)=X3**3
      AA(4,1)=0.0
      AA(4,2)=1.0
      AA(4,3)=2.0*X3
      AA(4,4)=3.0*X3**2
      DO 10 II=1,4
   10 CONTINUE
C
C     SETUP VECTOR OF ORIGINAL CONSTANTS -- BB
C
      BB(1)=Y2
      BB(2)=(Y2-YIN(1))/(X2-XIN(1))
      BB(3)=Y3
      BB(4)=(YIN(4)-Y3)/(XIN(4)-X3)
      NSIM=4
      KSIM=0
      CALL SIMO (AA,BB,NSIM,KSIM)
      D=BB(1)
      C=BB(2)
      A=BB(4)
      C=BB(2)
      B=BB(3)
   15 K=KSTART
      KOUNT=KOUNT+1
      XON(K+1)=XIN(2)
```

```
      YON(K+1)=YIN(2)
      DYDXO(K+1)=3.0*A*XON(K+1)**2+2.0*B*XON(K+1)+C
      CAPPA(K+1)=(6.0*A*XON(K+1)+2.0*B)/((1.0+DYDXO(K+1)**2)**1.5)
      ALPHA(K+1)=ATAN(DYDXO(K+1))
      DS=DELS/(1.0+.2*TANH(ABS(CAPPA(K+1))))
   20 K=K+1
      DXKP1=DS/(SQRT(1.0+DYDXO(K)))
      IF (XIN(3).LT.XIN(2)) DXKP1=-DXKP1
      XON(K+1)=XON(K)+DXKP1
      YON(K+1)=A*XON(K+1)**3+B*XON(K+1)**2+C*XON(K+1)+D
      DYDXO(K+1)=3.0*A*XON(K+1)**2+2.0*B*XON(K+1)+C
      CAPPA(K+1)=(6.0*A*XON(K+1)+2.0*B)/((1.0+DYDXO(K+1)**2)**1.5)
      DS=DELS/(1.0+.2*TANH(ABS(CAPPA(K+1))))
      ALPHA(K+1)=ATAN(DYDXO(K+1))
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
      IF (SLOP2.GT.1.0) GO TO 25
      IF (XIN(4).GE.X3.AND.XON(K+1).GT.X3) GO TO 30
      IF (XIN(4).LT.X3.AND.XON(K+1).LE.X3) GO TO 30
      GO TO 20
   25 IF (YIN(4).GE.Y3.AND.YON(K+1).GT.Y3) GO TO 30
      IF (YIN(4).LT.Y3.AND.YON(K+1).LE.Y3) GO TO 30
      GO TO 20
   30 IF (KOUNT.GT.100) GO TO 55
      DELSS=DELS
      DSTEST=((XON(K+1)-XIN(3))**2+(YON(K+1)-YIN(3))**2)**.5
      IF (ABS(DS-DSTEST).LT..01*DS) GO TO 35
      IF (DSTEST.LT..01*DS) GO TO 40
      IF (DSTEST-.5*DS) 50,45,45
   35 K=K-1
   40 XON(K+1)=XIN(3)
      YON(K+1)=YIN(3)
      GO TO 55
   45 DELS=DELS+(DS-DSTEST)/FLOAT(K-1-KSTART)
      IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
      GO TO 15
   50 DELS=DELS-DSTEST/FLOAT(K-KSTART)
      IF (KOUNT.GE.10) DELS=(DELS+DELSS)/2.0
      GO TO 15
   55 DELS1=DS*1.2
      IF (DELS1.GT.DELS) DELS1=DELS
      WRITE (6,65)KOUNT,A,B,C,D
      WRITE (6,70)DELSIN,DELS,DELS1,DSTEST
      KEND=K+1
      KSTART=KSTART+1
      DO 60 I=KSTART,KEND
      ALPHA(I)=ALPHA(I)/PI0180
   60 CONTINUE
      RETURN
C
C
   65 FORMAT (1H0,2X,I4,2X,10HITERATIONS,2X,4HA = ,1PE12.5,2X,4HB = ,1PE
     112.5,2X,4HC = ,1PE12.5,2X,4HD = ,1PE12.5)
   70 FORMAT (3X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT = ,
     1F8.5,3X,9HDSTEST = ,F8.5)
      END
```

```
      SUBROUTINE LEM (K)
C
C     SUBROUTINE TO CALCULATE POINTS ON A LEMNISCATE
C
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      DELSIN=DELS1
      K=K-1
      KSTART=K
      DELS=DELS1
      KOUNT=0
      IF (YIN(1).EQ.YIN(2)) GO TO 30
      IF (XIN(1).EQ.XIN(2)) GO TO 10
      SLOPE=(YIN(2)-YIN(1))/(XIN(2)-XIN(1))
      AROT=-TAN(SLOPE)
      GO TO 15
   10 SLOPE=99999.
      AROT=-PIO2
   15 DO 20 IROT=1,3
      XN=XIN(IROT)
      XIN(IROT)=XN*COS(AROT)-YIN(IROT)*SIN(AROT)
   20 YIN(IROT)=XN*SIN(AROT)+YIN(IROT)*COS(AROT)
   25 K=KSTART
   30 XON(K+1)=XIN(2)
      THETMX=ATAN(ABS((YIN(3)-YIN(2))/(XIN(3)-XIN(2))))
      A=SQRT(((XIN(3)-XIN(2))**2+(YIN(3)-YIN(2))**2)/(2.0*SIN(2.0*THETMX
     1)))
      YON(K+1)=YIN(2)
      CAPPA(K+1)=0.0
      DYDXO(K+1)=0.0
      ALPHA(K+1)=0.0
      KOUNT=KOUNT+1
      DSSAVE=DELS
      DS=DELS
      DTHET=DS**2/A**2
      THET=DTHET*.5
   35 R=A*SQRT(2.0*SIN(2.0*THET))
      DSCHEK=R*COS(THET)
      IF (DSCHEK.GT.1.1*DS) GO TO 40
      IF (DSCHEK.LT..9*DS) GO TO 45
      DELS=DS
      GO TO 50
   40 THET=THET-.02*DTHET
      GO TO 35
   45 THET=THET+.02*DTHET
      GO TO 35
   50 K=K+1
   55 R=A*SQRT(2.0*SIN(2.0*THET))
      XON(K+1)=XIN(2)-R*COS(THET)
      YON(K+1)=YIN(2)+R*SIN(THET)
      SON(K+1)=SON(K)+SQRT((XON(K+1)-XON(K))**2+(YON(K+1)-YON(K))**2)
      IF (ABS(SON(K+1)-SON(K)).GT.1.05*DS) GO TO 60
      IF (ABS(SON(K+1)-SON(K)).LT..95*DS) GO TO 65
      GO TO 70
   60 THET=THET-.02*DTHET
      GO TO 55
   65 THET=THET+.02*DTHET
```

```
      GO TO 55
   70 DYDXO(K+1)=-TAN(3.0*THET)
      ALPHA(K+1)=-3.0*THET
      CAPPA(K+1)=3.0*SQRT(SIN(2.0*THET)/2.0)/A
      DS=DELS/SQRT(1.0+ABS(CAPPA(K+1)))
      IF (ABS(DS-DSSAVE).GT..25*DSSAVE) DS=DSSAVE+SIGN(.25*DSSAVE,DS-DSS
     1AVE)
      DSSAVE=DS
      DTHET=DS*SQRT(SIN(2.0*THET)/2.0)/A
      THET=THET+DTHET
      IF (THET.LE.THETMX) GO TO 50
      IF (KOUNT.GT.50) GO TO 95
      DSTEST=((XON(K+1)-XIN(3))**2+(YON(K+1)-YIN(3))**2)**.5
      IF (DSTEST.GT.DS) GO TO 90
      IF (DSTEST.LT..0001*DS) GO TO 75
      IF (DSTEST-.5*DS) 85,85,80
   75 YON(K+1)=YIN(3)
      XON(K+1)=XIN(3)
      GO TO 95
   80 DELS=DELS-DSTEST/FLOAT(K+1-KSTART)
      GO TO 25
   85 DELS=DELS+DSTEST/FLOAT(K+1-KSTART)
      GO TO 25
   90 DELS=.8*DELS
      GO TO 25
   95 DELS1=DS*1.2
      IF (DELS1.GT.DELS) DELS1=DELS
      WRITE (6,115)KOUNT,THETMX,A
      WRITE (6,120)DELSIN,DELS,DELS1,DSTEST
      KEND=K+1
      KSTART=KSTART+1
      IF (YIN(2).EQ.YIN(1)) GO TO 105
      DO 100 KROT=KSTART,KEND
      XN=XON(KROT)
      XON(KROT)=XN*COS(AROT)+YON(KROT)*SIN(AROT)
      YON(KROT)=YON(KROT)*COS(AROT)-XN*SIN(AROT)
      ALPHA(KROT)=ALPHA(KROT)-AROT
      DYDXO(KROT)=TAN(ALPHA(KROT))
  100 CONTINUE
  105 DO 110 KAL=KSTART,KEND
  110 ALPHA(KAL)=ALPHA(KAL)/PI0180
      RETURN
C
C
  115 FORMAT (3X,I3,2X,13HITERATIONS---,3X,13HTHETMXCALC = ,F10.5,3X,8HA
     1CALC = ,F10.5)
  120 FORMAT (3X,10HDELS IN = ,F8.5,3X,7HDELS = ,F8.5,3X,11HDELS OUT = ,
     1F8.5,7X,9HDSTEST = ,F8.5)
      END
```

```
      SUBROUTINE MIRROR (K,YCL)
C
C     THIS SUBROUTINE MIRRORS THE HUB TO OBTAIN THE POINTS ON SHROUD
C             USED  FOR  2ZY  -  2-D INLETS
C
      COMMON /FOR3SS/ID,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PI0180
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NPDYS
      DO 10 J=1,NBDY1
      K=K+1
      ISTAR=1+NBDY1-J
      XON(K)=XON(ISTAR)
      YON(K)=2.0*YCL-YON(ISTAR)
      CAPPA(K)=-CAPPA(ISTAR)
      DYDXO(K)=-DYDXO(ISTAR)
      ALPHA(K)=-ALPHA(ISTAR)
      SON(K)=SON(ISTAR)
   10 CONTINUE
      WRITE (6,15)YCL
      RETURN

   15 FORMAT(34H0HUB MIRRORED INTO Y CENTERLINE = ,F8.3)
      END
```

```
      SUBROUTINE XYCALC(KSTART,K2,NIN)
C            -- XYCALC --
C.....GENERATES DATA FILES FOR ON-BODY POINTS.

      INTEGER SGEN
      REAL          X(300),Y(300),        C(300),S(300),SP(400)
      COMPLEX Z(300),DZ(300),D2Z,ZZ,FZTRP,DZTRP
      LOGICAL THIN,EVEN,SPGEN,DONE
      COMMON/SEGNO/NSEG,J
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      COMMON /SPGENC/      A,DSMAX,RMAX,THIN,B,TMIN,DSEND
      COMMON /FOR3SS/ID,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      DATA NSMAX,NSS,EMPTY,ONF/300,200,1.0E20,1.0001/
      NAMELIST /BODYIN/ Z,S1
      NAMELIST /AUXIN/ A,DSMAX,RMAX,TMIN,B,NFIN,SP,NSP,DSEND,DONE,
     1                 EVEN,THIN

C.....INITIALIZE PROGRAM.
   10 DO 15 I=1,NSMAX
   15 Z(I)=EMPTY
      S1=0.0
      NMAX=400
      A=.17
      DSMAX=DELSMX
      THIN=.FALSE.
      RMAX=1.2
      DSEND=DSMAX
      DONE=.FALSE.
      EVEN=.FALSE.
      B=0.3
      TMIN=0.1
      NFIN=0
      NSP=0

C.....INPUT BODY POINTS AND BODY TYPE.
   20 READ (NIN,BODYIN)
      DO 25 I=1,NSMAX
      IF (REAL(Z(I)).EQ.EMPTY) GO TO 30
   25 NS=I
   30 S(1)=S1
      IBAD=SGEN(S,Z,NS)
      IF (IPAD.NE.0) WRITE (6,125)IPAD

C.....SET UP DERIVATIVES + CURVATURES.
      DO 35 I=1,NS
   35 DZ(I)=DZTRP(S,Z,S(I),NS)
      DO 40 I=1,NS
      D2Z=DZTRP(S,DZ,S(I),NS)
   40 C(I)=AIMAG(CONJG(DZ(I))*D2Z)/CABS(DZ(I))**3

C.....INPUT AUXILLIARY (CONTROL) DATA.
   45 READ (NIN,AUXIN)
      IF (NFIN.EQ.0) NFIN=NS
      SFIN=S(NFIN)
      DSMAX=AMAX1(DSMAX,DSEND)
      IF (EVEN) GO TO 50
```

```
C.....GENERATE BODY POINTS ON A SEGMENT.
      IF (.NOT.SPGEN(S,Z,C,NS,SP,NSP,SFIN,NMAX)) GO TO 130
      GO TO 80

C.....GENERATE UPPER AND LOWER SURFACES TOGETHER (EVEN).
   50 SHALF=SFIN/2.0
      IF (NSP.LT.1) GO TO 55
      IF (SP(NSP).GE.SHALF/ONE) GO TO 60
   55 IF (.NOT.SPGEN(S,Z,C,NS,SP,NSP,SHALF,NMAX)) GO TO 140
   60 SREM=(SFIN-SP(NSP))/ONE
      DO 65 I=1,NSP
      IF (SP(I).GE.SREM) GO TO 70
   65 CONTINUE
      GO TO 140
   70 IF (NSP+I-1.GT.NMAX) GO TO 150
   75 I=I-1
      IF (I.LT.1) GO TO 80
      NSP=NSP+1
      SP(NSP)=SFIN-SP(I)
      GO TO 75

C.....TEST FOR FINISH.
   80 IF (DONE) GO TO 85
      GO TO 45

C.....OUTPUT RESULTING ON-BODY POINTS.
   85 DO 90 I=1,NSP
      ZZ=FZTRP(S,Z,SP(I),NS)
      DZ(I)=DZTRP(S,Z,SP(I),NS)
      D2Z=DZTRP(S,DZ,SP(I),NS)
      C(I)= AIMAG(CONJG(DZ(I))*D2Z)/CABS(DZ(I))**3
      X(I)=REAL(ZZ)
   90 Y(I)=AIMAG(ZZ)
      K1=KSTART
      K2=NSP+KSTART-1
      DO 110 I=K1,K2
      II=I-KSTART+1
      XON(I)=X(II)
      YON(I)=Y(II)
      CAPPA(I)=C(II)
      IF(ABS(CAPPA(I)).LT..0001)CAPPA(I)=0.
      IF (REAL(DZ(II)).EQ.0.) GO TO 100
      DYDXO(I)=AIMAG(DZ(II))/REAL(DZ(II))
      IF (ABS(DYDXO(I)).GT.999.) GO TO 100
      IF (ABS(DYDXO(I)).LT..0001) GO TO 95
      ALPHA(I)=ATAN(DYDXO(I))*180./3.14157
      GO TO 105
   95 DYDXO(I)=0.
      ALPHA(I)=0.
      GO TO 105
  100 DYDXO(I)=999.
      ALPHA(I)=90.
  105 SON(I)=0.
      IF(I.NE.1)SON(I)=SON(I-1)+SQRT((XON(I)-XON(I-1))**2+(YON(I)-YON(I-
     11))**2)
      IF((NSEG.EQ.0.AND.II.EQ.1).OR.(J.EQ.1.AND.II.EQ.1))SON(I)=0.
```

```
      IF (I.EQ.K1) GO TO 110
      IF(XON(I).EQ.XON(I-1))CAPPA(I)=CAPPA(I-1)
      IF (XON(I).EQ.XON(I-1)) GO TO 110
      IF((DYDXO(I)-DYDXO(I-1))/(XON(I)-XON(I-1))*CAPPA(I).LT.0.)CAPPA(I)
     1=-CAPPA(I)
      IF(I.EQ.(K1+1))CAPPA(I-1)=SIGN(CAPPA(I-1),CAPPA(I))
      IF(DYDXO(I)*DYDXO(I-1).LT.0..AND.DYDXO(I).GT.0.)CAPPA(I)=-ABS(CAPP
     1A(I))
      IF (I.LT.(K1+2)) GO TO 110
      IF (DYDXO(I)*DYDXO(I-2).LT.0.) GO TO 110
      IF ((DYDXO(I-1).GT.DYDXO(I).AND.DYDXO(I-1).LT.DYDXO(I-2)).OR.(DYDX
     1O(I-1).LT.DYDXO(I).AND.DYDXO(I-1).GT.DYDXO(I-2))) GO TO 110
      IF ((CAPPA(I-1).LE.CAPPA(I).AND.CAPPA(I-1).GE.CAPPA(I-2)).OR.(CAPP
     1A(I-1).GE.CAPPA(I).AND.CAPPA(I-1).LE.CAPPA(I-2))) GO TO 110
      CAPPA(I-1)=-CAPPA(I-1)
  110 CONTINUE
      WRITE (6,115)NS,NSP,DSMAX,X(1),Y(1),X(NSP),Y(NSP)
  115 FORMAT(1H0,7X,
     1           58HDIRECT INTERPOLATION. FULL POINT-SPACING REQUIREMEN
     1TS MET./24X,19HNO. OF INPUT PTS.= ,I4,2X,20HNO. OF OUTPUT PTS.= ,I
     24,2X,16HDSMAX = DSEND = ,F10.2/24X,14HSTART(X,Y) = (,F10.6,1H,,F10
     3.6,1H)/24X,12HEND(X,Y) = (,F10.6,1H,,F10.6,1H))
      IF (DONE) GO TO 120
  120 RETURN
C.....ERROR MESSAGES.
  125 FORMAT(20HSGEN FAILED.  IRAD= ,I3)
  130 WRITE (6,135)
  135 FORMAT(33HSPGEN UNABLE TO COMPLETE SEGMENT )
      STOP
  140 WRITE (6,145)
  145 FORMAT(29HSPGEN UNABLE TO DO EVEN BODY )
      STOP
  150 WRITE (6,155)NSP
  155 FORMAT(44HTOO MANY POINTS FOR BOTH SURFACES.  NLOWER= ,I4)
      STOP
      END
```

```
      LOGICAL FUNCTION SPGEN (S,Z,C,NS,SP,NSP,SFIN,NMAX)
C.....GENERATES TABLE SP HAVING VALUES OF PARAMETER S AS WIDELY SPACED
C     AS POSSIBLE AND YET SATISFYING THE FOLLOWING CONDITIONS ON DS
C        1   NSP .LE. NMAX
C        2   DS  .LE. A/C(S)     (C=CURVATURE)
C        3   DS  .LE. DSMAX
C        4A  DS(I) .LE. DS(I-1)*RMAX
C        4B  DS(I) .GE. DS(I-1)/RMAX
C     FOR THIN SECTIONS, AN ADDITIONAL CONDITION IS
C            DS  .LE. B*TLOC     (TLOC=LOCAL THICHNESS)
C.....SPGEN = .TRUE. IF ALL CONDITIONS HAVE BEEN SATISFIED.

      REAL S(NS),C(NS),SP(NMAX)
      COMPLEX Z(NS),FZIRP
      LOGICAL THIN,FIN
      COMMON /SPGENC/       A,DSMAX,RMAX,THIN,P,THIK,DSEND
      COMMON /MAIN/ XIN(10),YIN(10),DELSMX,PIO2,DELS1,IHUB
      DATA ONE,CMIN/1.0001,1.0E-6/
```

```
C.....INITIALIZATION SECTION.
      SPGEN=.FALSE.
      J1=MAX0(NSP,2)+1
      IF (NSP.GT.1) GO TO 15
      IF (NSP.LT.1) SP(1)=S(1)
      DS1=       DELS1
   10 SP(2)=SP(1)+DS1

C.....BEGIN MAIN LOOP.
   15 DO 45 J=J1,NMAX
      L=J
   20 I=L
   25 DSLAST=SP(I-1)-SP(I-2)
      SBAR=SP(I-1)+DSLAST/2.0
      CA=AMAX1(CMIN,ABS(FNTPP(S,C,SBAR,NS)))
      DSLIM=AMIN1(DS1   ,DSLAST*RMAX)
      IF (.NOT.THIN) GO TO 30
      TLOC=CABS(FZTRP(S,Z,SBAR,NS)-FZTRP(S,Z,S(NS)-SBAR,NS))
      DSLIM=AMIN1(DSLIM,B*AMAX1(TLOC,TMIN))
   30 DSFIN=SFIN-SP(I-1)
      NEVEN=DSFIN/DSLIM/ONE+1.0
      DSEVEN=DSFIN/FLOAT(NEVEN)
      DS=AMIN1(A/CA,DSEVEN)
      IF (I.NE.J) DS=AMIN1(DS,DSLAST/RMAX)

C.....CALCULATED VALUE OF DS SATISFIES CONDITIONS 2 THRU 4A.TEST FOR 4B.
      IF (DS.GE.DSLAST/RMAX) GO TO 40

C.....IF CONDITION 4B IS NOT SATISFIED, RE-DO EARLIER INTERVALS
C.....USING SMALLER VALUES OF DS.  IF RE-DOING ALL INTERVALS WON'T
C.....WORK, START OVER USING SMALLER STARTING VALUE OF DS (DS1).
   35 L=L-1
      IF (L.GE.J1) GO TO 20
      IF (NSP.GT.1) RETURN
      DS1=DS1/RMAX
      GO TO 10

C.....IF CONDITIONS 2 THRU 4B ARE SATISFIED, TEST FOR FINISH.
   40 SP(I)=SP(I-1)+DS
      FIN=SFIN/SP(I).LE.ONE
      IF (FIN.AND.DS.GT.DSEND) GO TO 35
      IF (FIN) GO TO 50
      IF (I.GE.J) GO TO 45
      I=I+1
      GO TO 25
   45 CONTINUE
C.....SPGEN =.FALSE. IF CONDITION 1 CANNOT BE SATISFIED.
      RETURN

C.....IF CONDITIONS ARE SATISFIED, UPDATE NSP.
   50 NSP=I
      DELS1=DS
      SPGEN=.TRUE.
      RETURN
      END
```

```
      INTEGER FUNCTION SGEN (S,F,NS)
C.....GENERATES THE PARAMETER ARRAY S FOR THE SET OF POINT-PAIRS F SUCH
C.....THAT S(I) GIVES THE LINE INTEGRAL ON THE CURVE OF FZTRP (S,F,X,NS)
C.....WHEN X=S(I).
      REAL S(NS)
      COMPLEX F(NS),DZTRP
      DATA MAX,N,FN,TEST/4,10,10.0,0.01/
      DO 10 I=2,NS
   10 S(I)=S(I-1)+CABS(F(I)-F(I-1))
      DO 30 K=1,MAX
      SGEN=0
      DO 25 I=2,NS
      DS=S(I)-S(I-1)
      DARG=DS/FN
      ARG0=S(I-1)-DARG/2.0
      SUM=0.0
      DO 15 J=1,N
      ARG=ARG0+FLOAT(J)*DARG
   15 SUM=SUM+(CABS(DZTRP(S,F,ARG,NS))-1.0)
      SUM=SUM/FN
      ERROR=ABS(SUM)
      DS=DS*SUM
      DO 20 J=1,NS
   20 S(J)=S(J)+DS
      IF (ERROR.GT.TEST.AND.SGEN.EQ.0) SGEN=I
   25 CONTINUE
      IF (SGEN.EQ.0) RETURN
   30 CONTINUE
C.....SGEN=INDEX IF IT DOESN'T CONVERGE.
      RETURN
      END
```

```
      COMPLEX FUNCTION DZTRP (A,F,X,NA)
C.....COMPLEX DERIVATIVE EVALUATION FOR DOUBLE 3-POINT INTERPOLATION.
      COMPLEX F(NA)
      COMMON /NTRPC3/ I1,I2,C(4)
C.....FIRST EVALUATE FUNCTION COEFFICIENTS.
      CALL FNTRPA (A,X,NA)
      CALL DNTRPC
C.....THEN EVALUATE FUNCTION VALUE.
      DZTRP=0.0
      J=0
      DO 10 I=I1,I2
      J=J+1
   10 DZTRP=DZTRP+C(J)*F(I)
      RETURN
      END
```

```
      SUBROUTINE DNTRPC
C.....CALCULATION OF C COEFFICIENTS FOR DERIVATIVES OF DOUBLE
C.....3-POINT INTERPOLATION.
      COMMON /NTRPC1/ L,I,A11,A12,A13,A14,A22,A23,A24,A33,A34,A44
      COMMON /NTRPC3/ I1,I2,C1,C2,C3,C4
      IF (L.LE.1) GO TO 25
      IF (L-3) 20,15,10
C.....FOR DOUBLE 3-POINT INTERPOLATION.
   10 C1=+(A22+A33+A22)/A23*A33/A12/A13
      C4=-(A33+A22+A33)/A23*A22/A34/A24
      P=A23*A23
      C2=-((A11+A33+A11)*A33/A12+(A33*A44+A22*A44+A22*A33)/A24)/P
      C3=+((A44+A22+A44)*A22/A34+(A22*A11+A33*A11+A33*A22)/A13)/P
      GO TO 30
C.....FOR SIMPLE 3-POINT INTERPOLATION.
   15 C1=+(A33+A22)/A12/A13
      C2=-(A33+A11)/A12/A23
      C3=+(A22+A11)/A13/A23
      GO TO 30
C.....FOR 2-POINT INTERPOLATION.
   20 C1=1.0/A12
      C2=-C1
      GO TO 30
C.....ONLY ONE TABLE VALUE GIVEN.
   25 C1=0.0
   30 I1=I
      I2=I+L-1
      RETURN
      END
```

```
      FUNCTION FNTRP (A,F,X,NA)
C.....FUNCTION EVALUATION FOR DOUBLE 3-POINT INTERPOLATION.
      REAL F(NA)
      COMMON /NTRPC2/ I1,I2,C(4)
C.....FIRST EVALUATE FUNCTION COEFFICIENTS.
      CALL FNTRPA (A,X,NA)
      CALL FNTRPC
C.....THEN EVALUATE FUNCTION VALUE.
      ENTRY FNTRP1 (F)
      FNTRP=0.0
      J=0
      DO 10 I=I1,I2
      J=J+1
   10 FNTRP=FNTRP+C(J)*F(I)
      RETURN
      END
```

```
      COMPLEX FUNCTION FZTRP (A,F,X,NA)
C.....COMPLEX FUNCTION EVALUATION BY DOUBLE 3-POINT INTERPOLATION.
      COMPLEX F(NA)
      COMMON /NTRPC2/ I1,I2,C(4)
C.....FIRST EVALUATE FUNCTION COEFFICIENTS.
      CALL FNTRPA (A,X,NA)
      CALL FNTRPC
C.....THEN EVALUATE FUNCTION VALUE.
      FZTRP=0.0
      J=0
      DO 10 I=I1,I2
      J=J+1
   10 FZTRP=FZTRP+C(J)*F(I)
      RETURN
      END
```

```
      SUBROUTINE FNTRPC
C.....CALCULATION OF C COEFFICIENTS FOR FUNCTION VALUES BY DOUBLE
C.....3-POINT INTERPOLATION.
      COMMON /NTRPC1/L,I,A11,A12,A13,A14,A22,A23,A24,A33,A34,A44
      COMMON /NTRPC2/ I1,I2,C1,C2,C3,C4
      IF (L.LE.1) GO TO 25
      IF (L-3) 20,15,10
C.....FOR DOUBLE 3-POINT INTERPOLATION.
   10 C1=+A33/A23*A22/A12*A33/A13
      C4=-A22/A23*A33/A34*A22/A24
      P2=A33/A23*A11/A23
      P3=A22/A23*A44/A23
      C2=-A33*(P2/A12+P3/A24)
      C3=+A22*(P3/A34+P2/A13)
      GO TO 30
C.....FOR SIMPLE 3-POINT INTERPOLATION.
   15 C1=+A22/A12*A33/A13
      C2=-A11/A12*A33/A23
      C3=+A11/A13*A22/A23
      GO TO 30
C.....FOR 2-POINT INTERPOLATION.
   20 C1=+A22/A12
      C2=-A11/A12
      GO TO 30
C.....ONLY ONE TABLE VALUE GIVEN.
   25 C1=1.0
   30 I1=I
      I2=I+L-1
      RETURN
      END
```

```
      SUBROUTINE FNTRPA (A,X,NA)
C.....COMMON SUBROUTINE EVALUATES A COEFFICIENTS IN DOUBLE
C.....3-POINT INTERPOLATIONS.
C       L=NO. OF POINTS IN THE FIT
C       I=INDEX TO FIRST POINT
      REAL A(NA)
      COMMON /NTRPC1/ L,I,A11,A12,A13,A14,A22,A23,A24,A33,A34,A44
C.....GET I AND L BY TABLE LOOK-UP.
      L=LIMIT (1,NA,3)
      M=MAX0(1,NA-2)
      CALL TLU (A,X,NA,J)
      IF (J.EQ.LIMIT(2,J,M)) L=4
      I=LIMIT(1,J-1,M)
C.....CALCULATE A-ARRAY.
      A11=A(I)
      A22=A(I+1)
      A33=A(I+2)
      IF (L.NE.4) IF (L-2) 20,15,10
      A44=A(I+3)
      A14=A11-A44
      A24=A22-A44
      A34=A33-A44
      A44=X-A44
   10 A13=A11-A33
      A23=A22-A33
      A33=X-A33
   15 A12=A11-A22
      A22=X-A22
      A11=X-A11
   20 RETURN
      END
```

```
      SUBROUTINE TLU (TABLE,ARG,N,I)
C.....TABLE LOOK UP   FINDS I SUCH THAT
C     ARG.GE.TABLE(I).AND.ARG.LT.TABLE(I+1)
C       IF I=0, ARG.LT.TABLE(1)
C       IF I=N, ARG.GE.TABLE(N)
      REAL TABLE(N)
      I=LIMIT(1,I,N)
      IF (ARG.GE.TABLE(I)) GO TO 15
C.....DESCEND IN TABLE.
   10 I=I-1
      IF (I.LE.0) RETURN
      IF (ARG.GE.TABLE(I)) RETURN
      GO TO 10
C.....ASCEND IN TABLE.
   15 IF (I.GE.N) RETURN
      IF (ARG.LT.TABLE(I+1)) RETURN
      I=I+1
      GO TO 15
      END
```

C-2

```
      FUNCTION LIMIT (I,J,K)
C.....INTEGER FUNCTION LIMITS J BETWEEN I AND K.
      LIMIT=I
      IF (J.LT.LIMIT) RETURN
      LIMIT=K
      IF (J.GT.LIMIT) RETURN
      LIMIT=J
      RETURN
      END
```

```
      SUBROUTINE WPUNCH
      COMMON /FOREOD/ KGEOMF,ISIGF,ICURVN,NONEWF,IVCRT,AL
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /FOR3SS/IO,DFLS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PI0180
      COMMON /WRITE/ IFLAG,NDY4,PROG,TITLE(9),BODIES(4),IDENT,YLO(25),YH
     1I(25),NDY(25),XRAK(25),NBDPTS(5),N06,NRAKES
      COMMON/ LOT/XMIN,YMIN,ORD,EXEP,XX,YY,LPNCHO,IPLOTA,MH
      DIMENSION YOFF(200), XOFF(200), FI(500)
      DIMENSION X(25),Y(25)
      COMMON /MNSD/ NNSD,NSDBDY(10)
      DATA BODYD/6H-BODY /,IFLAG1/4H 111/,IFLAG2/4H 1 1/,T22Y/6H   23Y/,
     1IFLG2A/1H /,IFLG2B/1H1/
C
C     IF YLO AND YHI ARE READ IN AS ZERO,CALCULATE THEM FOR THAT RAKE
C           (FOR HUB AND SHROUD CASES ONLY)     1/4/73
C
C     FIND HIGHLIGHT ON THE SHROUD
C
      NINE=9
      NEIGHT=8
      I21=21
      IONE=1
      ITWO=2
      IZER=0
      NB=NBDPTS(1)+1
      IF(IFLAG.EQ.1)NB=1
      NE=NBDPTS(2)
C ( SET JMIN=LAST SHROUD PT., IN CASE X NEVER INCREASES ON SHROUD(VTOL)
      JMIN=NE
      DO 10 I=NB,NE
      IF (XON(I+1).LT.XON(I)) GO TO 10
      JMIN=I
      GO TO 15
   10 CONTINUE
   15 DO 20 I=1,NE
   20 FI(I)=I
      NOFF=0
      IF (NRAKES.EQ.0) GO TO 70
      DO 65 I=1,NRAKES
      NLO=NOFF+1
      NOFF=NLO+NDY(I)
      ENDY=NDY(I)
      IF (YHI(I).EQ.0.0.OR.YLO(I).EQ.0.0) GO TO 25
      GO TO 35
   25 IF (YHI(I).NE.0.0) GO TO 30
      CALL SINTP (XON(NB),YON(NB),JMIN-NB+1,XRAK(I),YH)
      CALL SINTP (XON(NB),FI(NB),JMIN-NB+1,XRAK(I),FII)
      IF=FII
      DS=SQRT((XON(IF)-XON(IF+1))**2+(YON(IF)-YON(IF+1))**2)
      YHI(I)=YH-DS
```

```
   30 IF (YLO(I).NE.0.0.OR.XRAK(I).LT.XON(1)) GO TO 35
      CALL SINTP (XON,YON,NBDPTS(1),XRAK(I),YL)
      CALL SINTP (XON,FI,NBDPTS(1),XRAK(I),FII)
      IF=FII
      DS=SQPT((XON(IF)-XON(IF+1))**2+(YON(IF)-YON(IF+1))**2)
      YLO(I)=YL+DS
   35 DYI=(YHI(I)-YLO(I))/ENDY
      K=0
      DO 55 J=NLO,NOFF
      DJM=J-NLO
      XOFF(J)=XRAK(I)
      YOFF(J)=YLO(I)+DYI*DJM
      YMAN=YY*ORD+YMIN
      IF(LPNCHO.EQ.2) YOFF(J)=YMAN-(YOFF(J)-YMAN)
      IF (XOFF(J)-XMIN) 55,40,40
   40 IF (XOFF(J)-XX*EXEP-XMIN) 45,45,55
   45 IF (YOFF(J)-YY*ORD-YMIN) 50,50,55
   50 K=K+1
      X(K)=XOFF(J)
      Y(K)=YOFF(J)
   55 CONTINUE
C
C((((((   PLOT OFF-BODY POINTS (RAKES)
C
   60 CALL LINE(X,Y,K,1,-1,0,XMIN,EXEP,YMIN,ORD)
   65 CONTINUE
C
C((((((  PUNCH OPTION ((((((
C
      IF (LPNCHO.EQ.0) RETURN
   70 NTBDY=NBDYS+NNSD+1-IVORT
      NLOOP=2-IVORT
      IF (NBDYS.EQ.3.AND.PROG.NE.T22Y)GOTO75
      GO TO 80
   75 NTBDY=NTBDY+1
      NLOOP=3
   80 K=0
      IF(PROG.EQ.T22Y) NLOOP=1
      DO 11^ I=1,NLOOP
      M=NTBDY-I+1
      IFLAGG=IFLAG2
      IF (M.EQ.NTBDY                    .OR.NBDYS.EQ.3.AND.M.EQ.3) IFLAGG=IFL
     1AG1
      IF (PROG.EQ.T22Y) GO TO 92
      WRITE (17,115)(TITLF(L),L=1,9),M,BODYD,IDENT
      WRITE (17,120)M,IFLAGG,N06,IVORT,IDENT
   90 CONTINUE
                      WRITE (17,125)IDENT
   92  NA=1
      NS=0
      IF (I.NE.1) K=1
      DO 105 J=1,M
      IF (J.GT.NBDYS.AND.NNSD.NE.0) GO TO 95
      NP=NBDPTS(J)
      GO TO 100
   95 NS=NS+1
      IF (NS.GT.NNSD) NSDBDY(NS)=NBDPTS(NBDYS+1)-NBDPTS(NBDYS)
```

```
      NB=NSOBDY(NS)+NA-1
  150 NP=NB-NA+1
      IF(PROG.NE.T22Y)GOTO102
      LASBOD=0
      NO1BOD=2
      IF(J.EQ.1) NO1BOD=1
      IF(J.EQ.M)LASBOD=1
      IF(J.EQ.1)ICURVN=1-ICURVN
                WRITE(17,130)J,IGEOMF,ICURVN, (TITLE(L),L=1,6),NO1BOD,
     1IVORT,LASBOD,IONE
C     T R A N S F "
  102 CALL WRTXY (NP,IDENT,J,K,XON,YON,NA,NB,PROG)
      NA=NB+1
  105 CONTINUE
      IF(PROG.NE.T22Y                  )GOTO107
      WRITE(17,140) (TITLE(L),L=1,6),NEIGHT
      V2=2.
      WRITE(17,145) AL,IONE,IONE,V2,IZEP,NINE
      WRITE(17,155)XX,XMIN,EXEP,YY,YMIN,ORD
  107 K=0
      NA=1
      J=0
      NB=NOFF
      IF(PROG.NE.T22Y)GOTO108
      IF(NB.GT.100)NB=100
      IG=0
      IF(NOFF.LE.100)IG=1
                WRITE(17,150) IONE,(TITLE(L),L=1,6),IG,I21
C  T R A N S F "
  108 CALL WRTXY (NOFF,IDENT,J,K,XOFF,YOFF,NA,NB,PROG)
     , IF (PROG.NE.T22Y) GO TO 110
      IF(NOFF.LE.100)GOTO110
      WRITE(17,150)ITWO,(TITLE(L),L=1,6),IONE,I21
C     T R A N S F "
      NOF=NOFF-100
      NA=NB+1
      NB=NOFF
      CALL WRTXY(NOF,IDENT,J,K,XOFF,YOFF,NA,NB,PROG)
  110 CONTINUE
      RETURN
C
C     FORMATS
C
C
C
  115 FORMAT (     9A6,I1,A6,2X,A6)
  120 FORMAT (     I1,A4,I1,8X,I1,47X,A6,11X)
  125 FORMAT (     62X,A6,11X)
  130 FORMAT(     3(I1,2X),1X,6A6,12X,I1,5X,I1,2X,I1,3X,I1)
  135 FORMAT (     3H0.0,7X,3H0.0,7X,3H90.)
  140 FORMAT(10X,6A6,25X,I1)
  145 FORMAT(5X,F10.2,19X,I1,9X,I1,10X,F9.3,5X,I1,1X,I1)
  150 FORMAT(I1,8X,6A6,22X,I1,2X,I2)
  155 FORMAT(8F10.3)
      END
```

```
      SUBROUTINE WRTXY (NP,IDENT,J,K,X,Y,NA,NB,PROG)
C
C     WRITE X AND Y COORDINATES
C
      DIMENSION X(1), Y(1)
      COMMON /FOREOD/ IGEOMF,ISIGF,ICURVN,NONEWF,IVORT
      DIMENSION V(8)
      DATA T22Y/6H   23Y/
      DATA V/6H(     ,6H      ,6HF10.5,,6H      ,6HX,     ,6H4X,I1,,
     16H2X,I1,,6H3X,I1)/
      IF (PROG.NE.T22Y) GO TO 10
      LASY=1
      NFUL =(NB-NA+1)/6
      NFULL=NFUL *6
      NREST=NA+NFULL-1
      NDIF=NB-NA+1-NFULL
      NREST1=NREST+1
```

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```
      IT=3
      NAA=NA-6
      DO 2 LC=1,NFUL
      NAA=NAA+6
      NSTOP=NAA+5
      IF(NSTOP.EQ.NB)GOTO5
      WRITE(17,40)(X(L),L=NAA,NSTOP),IT
2      CONTINUE
      IF(NDIF.EQ.0)GOTO6
      NDIFM=(6-NDIF)*10
      ENCODE(6,56,DUMP)NDIF
      ENCODE(6,56,DUMP2)NDIFM
      DECODE(6,59,DUMP)VEE
      DECODE(6,59,DUMP2)VE2
      V(2)=VEE
      V(4)=VE2
      WRITE(17,V)  (X(LL),LL=NREST1,NB),NDIF,LASY,IT
      GOTO6
5     WRITE(17,45)(X(L),L=NAA,NSTOP),LASY,IT
 45   FORMAT(6F10.5,7X,I1,3X,I1)
6      IT=4
      NAA=NA-6
      DO 300 LC=1,NFUL
      NAA=NAA+6
      NSTOP=NAA+5
      IF(NSTOP.EQ.NB)GOTO7
      WRITE(17,40)(Y(L),L=NAA,NSTOP),IT
300   CONTINUE
      IF(NDIF.EQ.0)RETURN
      WRITE(17,V)  (Y(LL),LL=NREST1,NB),NDIF,LASY,IT
      RETURN
7     WRITE(17,45)(Y(L),L=NAA,NSTOP),LASY,IT
      RETURN
10    WRITE (17,25)IGEOMF,ISIGF,ICURVN,NONEWF,NP,IDENT
   15 WRITE (17,30)J,K,IDENT
   20 IF (K.EQ.1) RETURN
      WRITE (17,35)(X(L),L=NA,NB)
      WRITE (17,35)(Y(L),L=NA,NB)
      RETURN
C
C     FORMAT STATEMENTS
C
C
C
   25 FORMAT (4I1,3X,I3,52X,A6,11X)
   30 FORMAT (     9X,I1,9X,I1,42X,A6,11X)
   35 FORMAT(6E13.8)
   40 FORMAT(6F10.5,11X,I1)
55    FORMAT(1H+,64X,I1,2X,I1,3X,I1)
   56 FORMAT(I6)
   59 FORMAT(A6)
      END
```

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```
      SUBROUTINE AREAA
      COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /FOR3SS/IO,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PIO180
      COMMON /MNSD/ NNSD,NSDBDY(10)
      COMMON/ LOT/XMIN,YMIN,ORD,EXEP,XX,YY,LPNCHO,IPLOTA,MM
      DIMENSION JMAX(20), JMIN(20),                  AREAS(20), YAR(20)
     1,XXA(200),          DISC(200),ANULUS(200)
      PI=3.14159265
      JPLA=0
      NBP1=NBDY1+1
      DO 10 J=NBP1,NBODY2
      JJ=J
C((((((  .LT. CHANGED TO LE. TO AVOID AREA PLOTS FROM GOING UP VSTOL LIP
      IF (XON(J).LE.XON(J+1)) GO TO 15
   10 CONTINUE
   15 WRITE (6,75)
      IF (NNSD.EQ.0) GO TO 40
C
C     SEARCH FOR MINIMUM AND MAXIMUM X ON EACH NSD (SPLITTER)
C
      NB=NBODY2+1
      NE=NBODY2+NSDBDY(1)
      DO 35 I=1,NNSD
      XMIN=XON(NB)
      JMIN(I)=NB
      XMAX=XON(NB)
      JMAX(I)=NB
      NEM1=NE-1
      DO 30 J=NB,NEM1
      IF (XON(J).GT.XMAX) GO TO 20
      IF (XON(J).LT.XMIN) GO TO 25
      GO TO 30
   20 XMAX=XON(J)
      JMAX(I)=J
      GO TO 30
   25 XMIN=XON(J)
      JMIN(I)=J
   30 CONTINUE
      NB=NE+1
      NE=NE+NSDBDY(I+1)
      WRITE (6,80)XMIN,XMAX,JMIN(I),JMAX(I)
   35 CONTINUE
   40 DO 65 J=NBP1,JJ
      IA=1
      YAR(IA)=0.
      IF(NBDY1.EQ.0)GOTO50
      CALL SINTP (XON,YON,NBDY1,XON(J),YAR(IA))
      IF (NNSD.EQ.0) GO TO 50
      JEND=NBODY2
      DO 45 I=1,NNSD
      JMI=JMIN(I)
      JMA=JMAX(I)
      JEND=NSDBDY(I)+JEND
      IF (XON(J).GT.XON(JMA).OR.XON(J).LT.XON(JMI)) GO TO 45
      IA=IA+1
      CALL SINTP (XON(JMA),YON(JMA),JMI-JMA+1,XON(J),YAR(IA))
      IA=IA+1
      CALL SINTP (XON(JMI),YON(JMI),JEND-JMI+1,XON(J),YAR(IA))
   45 CONTINUE
   50 IA=IA+1
```

```
      YAR(IA)=YON(J)
      IS=0
      AREA=0.0
      DO 55 I=1,IA,2
      IS=IS+1
      AREAS(IS)=(YAR(I+1)**2-YAR(I)**2)*PI
      AREA=AREA+AREAS(IS)
   55 CONTINUE
      AREAD=AREA+YAR(1)**2*PI
      ENSUBK=CAPPA(J)*(YON(J)-YAR(1))/SQRT(1.+YAR(1)/YON(J))
      IF(CAPPA(J).GT.90000.)ENSUBK=99999.
      IF (NNSD.EQ.0) GO TO 60
      WRITE (6,85)(AREAS(I),I=1,IS)
   60 WRITE (6,90)J,XON(J),YON(J),YAR(1),AREA,AREAD,ENSUBK
      WRITE (6,95)
      IF (XON(J).GT.(XX*EXEP+XMIN)) GO TO 65
      JPLA=JPLA+1
      XXA(JPLA)=XON(J)
      ANULUS(JPLA)=AREA
      DISC(JPLA)=AREAD
   65 CONTINUE
C((((((   IF AREA PLOT IS NOT REQUIRED, GO TO 70
      IF (IPLOTA.LE.0) GO TO 70
      CALL CSCALE(DISC,YY,JPLA,1,10,EXMIN,DEEX)
      CALL CSCALE(ANULUS,YY,JPLA,1,10,EXMIN,DEEX)
      DISC(JPLA+1)=EXMIN
      DISC(JPLA+ 2)=DEEX
      CALL PLOT(XX,0.,-3)
      CALL PLOXIS(XX,YY,EXEP,DISC(JPLA+2),XMIN,DISC(JPLA+1),.25,.25,0,0,
     14,3,0,0)
C((((((  PLOT THE DISC AREA VS. X
      CALL LINE(XXA,DISC,JPLA,1,1,3,XMIN,EXEP,DISC(JPLA+1),DISC(JPLA+2))
C(((((( PLOT  THE ANNULUS AREA VS. X
      CALL LINE(XXA,ANULUS,JPLA,1,1,3,XMIN,EXEP,DISC(JPLA+1),DISC(JPLA+2
     1))
   70 RETURN
C
   75 FORMAT (1H1//9X,1HI,14X,3HXON,18X,3HYON,16X,4HYONH,12X,4HAREA,14X,
     19HDISC AREA,10X,6HENSUBK)
   80 FORMAT (1H0,5X,7HXMIN = ,1PE14.5,5X,7HXMAX = ,1PE14.5,5X,7HJMIN =
     1,I6,5X,7HJMAX = ,I6)
   85 FORMAT (74X,1PE19.4)
   90 FORMAT (8X,I3,1P6E19.4)
   95 FORMAT (1H0)
      END
```

```
      SUBROUTINE DRAW(KR,KK )
C(((((( SUBPOUTINE ADDED TO DRAW PICTURE OF INLET VIA CALCOMP PLOTTER.
C(((((( CALLED ONCE FOR EACH SEGMENT
C
      DIMENSION X(200),Y(200)
        COMMON /SS/ NBDY1,NBODY2,TYPBDY,NBDYS
      COMMON /FOR3SS/ID,DELS,XBK(20),YBK(20),XON(500),YON(500),DYDXO(500
     1),ALPHA(500),CAPPA(500),SON(500),PI018D
      COMMON/ LOT/XMIN,YMIN,ORD,EXEP,XX,YY,LPNCHO,IPLOTA,MM
      COMMON/TOL/BAGS(15),BAGX(15),ZAP(15),NZAP(15)
      KL=KR+1
      II=0
      DO 20 I=1,KL
      N=KK+I-1
      IF (II.GE.200.OR.N.GT.500) GO TO 30

C((((((   TEST EACH (X,Y) PT. EXCLUDE THOSE BEYOND (XX*EXEP+XMIN) INCHES
      YMAN=YY*ORD+YMIN
      IF(LPNCHO.EQ.2)  YON(N)=YMAN-( YON(N)-YMAN)
      IF (XON(N)-XX*EXEP-XMIN) 10,10,20
   10 IF (YON(N)-YY*ORD-YMIN) 15,15,20
   15 II=II+1
      X(II)=XON(N)
      Y(II)=YON(N)
      IF (II.NE.1.OR.TYPBDY.EQ.1.) GO TO 20
C((((((  STORE CURVATURE VALUES OF SEGMENT'S FIPST PT. FOR USE WITH
C SUBSEQUENT CURVATURE PLOTS.
      MM=MM+1
      BAGX(MM)=XON(N)
      BAGS(MM)=SON(N)
      ZAP(MM)=CAPPA(N)
      NZAP(MM)=N
   20 CONTINUE
C((((((  DRAW A SEGMENT MARKER AT FIRST PT. OF SEGMENT
      IF (XON(KK).GT.(XX*EXEP+XMIN).OR.YON(KK).GT.(YY*ORD+YMIN)) GO TO 2
     *5
      XSYM= (X(1)-XMIN)/EXEP
      YSYM=(Y(1)-YMIN)/ORD
      CALL SYMBOL(XSYM,YSYM,.2,1,0.,-1)
   25 CALL LINE(X,Y,II,1,1,3,XMIN,EXEP,YMIN,ORD)
      RETURN
   30 WRITE (6,35)II,N
   35 FORMAT(1H0,' SCIRCLE ERROR EXIT - DATA POINTS EXCEED 200 ON A SEG
     1OR EXCEED 500 ON TOTAL INLET - ' /2I8)
      STOP
      END
```

```
      SUBROUTINE PLOXIS(XX,YY,EXEP,ORD,OFSETA,OFSET,SLETRS,SNOSZ,K5,K6,K
     1,L,NK,NL)
C
C*****************************************************************
C******   SUBROUTINE ADDED TO DRAW AND LABEL AXIS FRAMES FOR ALL PLOTS *
      COMMON/TITL/ TTITL(9,6)
      UP =11.-YY-2.*SNOSZ
      M1=XX
      M2=YY
      CALL PLOT(4.,-11.,-3)
      CALL PLOT(0.,UP,-3)
      DO 25 I=1,M1
      X=I
      P=EXEP*X +OFSETA
      CALL PLOT(X,0.,2)
      CALL PLOT(X, .2,2)
      M=I/2
      B=FLOAT(I)-FLOAT(M)-X/2.
      IF (B) 10,10,25
   10 IF (K5) 15,15,20
   15 CALL NUMBER(X-SNOSZ,-SNOSZ-.10,SNOSZ,P,0.,NK)
      GO TO 25
   20 SN = 1.333*SNOSZ
```

```
      CALL NUMBER(X-SNOSZ-SNOSZ,-SN-SNOSZ-.10,SN,10.,0.,-1)
      CALL NUMBER(999.0,-SNOSZ -.10,SNOSZ,P,0.,NK)
   25 CALL PLOT(X,0.,3)
      B = (XX-54.*SLETRS)/2.
      CALL SYMBOL(B,-SNOSZ-SLETRS-.15-.6,SLETRS,TTITL(1,K),0.,54)
      CALL PLOT(0.,0.,3)
      DO 45 J=1,M2
      Y=J
      O=ORD*Y+OFSET
      CALL PLOT(0.,Y,2)
      CALL PLOT(.2,Y,2)
      N=J/2
      B=FLOAT(J)-FLOAT(N)-Y/2.
      IF (B) 30,30,45
   30 IF (K6) 35,35,40
   35 CALL NUMBER(-4.*SNOSZ       -.15,Y,SNOSZ,O,0.,NL)
      GO TO 45
   40 SN = 1.333*SNOSZ
      CALL NUMBER(-.15 -SN-SN-SN    ,Y-SNOSZ,SN,10.,0.,-1)
      CALL NUMBER(999.0,Y+SN-SNOSZ,SNOSZ,O,0.,NL)
   45 CALL PLOT(0.,Y,3)
      C = (YY-54.*SLETRS)/2.
      CALL SYMBOL(-SNOSZ-SNOSZ-SNOSZ-.15-.6,C,SLETRS,TTITL(1,L),90.,54)
      CALL PLOT(0.,YY,3)
      CALL PLOT(XX,YY,2)
      CALL PLOT(XX,0.,2)
      DO 55 J=1,M2,2
      Y=J
      IF (Y.EQ.YY) GO TO 55
      CALL PLOT(XX,Y,3)
      CALL PLOT(0.,Y,2)
      IF ((Y+1.).EQ.YY) GO TO 55
      CALL PLOT(0.,Y+1.,3)
   50 CALL PLOT(XX,Y+1.,2)
   55 CONTINUE
      DO 60 J=1,M1,2
      X=J
      IF (X.EQ.XX) GO TO 65
      CALL PLOT(XX-X,YY,3)
      CALL PLOT(XX-X,0.,2)
      IF ((XX-X-1.).EQ.0.) GO TO 65
      CALL PLOT(XX-X-1.,0.,3)
   60 CALL PLOT(XX-X-1.,YY,2)
   65 RETURN
      END
```

```
      SUBROUTINE SINTP (Z,W,N,X1,Y1)
C(((((( ENLARGED FROM THE ORIGINAL (200)
      DIMENSION A(13)
      DIMENSION X(250), Y(250), Z(250), W(250)
      DATA EODFF/6HENDOFF/
      DO 10 I=1,N
      X(I)=Z(I)
   10 Y(I)=W(I)
      CALL SORTXY (X,Y,N)
C
      DO 15 I=1,N
      K=I
      IF (X1.GT.X(I)) GO TO 15
      IF (X1.EQ.X(I)) GO TO 20
      IF (X1.LT.X(I)) GO TO 25
   15 CONTINUE
   20 Y1=Y(K)
      GO TO 30
   25 IF (K.EQ.1) GO TO 35
      IF (K.EQ.N) K=N-1
      W1=(X1-X(K))*(X1-X(K+1))/(X(K-1)-X(K))/(X(K-1)-X(K+1))
      W2=(X1-X(K-1))*(X1-X(K+1))/(X(K)-X(K-1))/(X(K)-X(K+1))
      W3=(X1-X(K-1))*(X1-X(K))/(X(K+1)-X(K-1))/(X(K+1)-X(K))

      Y1=Y(K-1)*W1+Y(K)*W2+Y(K+1)*W3
   30 RETURN
   35 Y1=0.
      RETURN
      ENTRY ECHO
      CALL ERTRAN(6,'0AS6,T 25. . ')
      WRITE (6,40)
   40 FORMAT(1H1,23X,' INPUT FILE DUMP'/)
   45 READ (5,50,END=60)A
   50 FORMAT(13A6)
      WRITE (6,55)A
      WRITE (25,50)A
   55 FORMAT(1H ,13A6)
      GO TO 45
   60 WRITE (25,50)EODFF
      REWIND 25
      RETURN
      END
```

```
      SUBROUTINE SORTXY(X,Y,NPTS)
      DIMENSION X(100),Y(100)
   10 N=NPTS
   15 NN=N-1
   20 DO 55 KT=1,NN
      XMIN=X(KT)
      JAD=KT
      JKL=KT+1
   25 DO 45 JK=JKL,N
   30 IF (XMIN-X(JK)) 45,45,35
   35 XMIN=X(JK)
   40 JAD=JK
   45 CONTINUE
   50 YMIN=Y(JAD)
      X(JAD)=X(KT)
      Y(JAD)=Y(KT)
      X(KT)=XMIN
      Y(KT)=YMIN
   55 CONTINUE
      RETURN
      END
```

PROGRAM 23Y

```
C  NEWMAN PROGRAM - TWO DIMENSIONAL MULTIELEMENT AIRFOILS
C
C  THIS IS THE EXECUTIVE ROUTINE FOR THE NEW NUEMANN
C
C
      COMMON /BFLAG/ IDB(10), INL(10), IFL(10), NL(10), LIFT(10),
     1               IBMF(10), ISAV1(10), ISAV2(10), ISAV3(10),
     2               BTITLE(10,  7), IBT, IBST, IBTOT, NELTOT,
     3               ITRP(10), INMB(10), CHORDB(10), IBD(10), LIFTOT
     4               ,IPRB(10), IFST(10), ISEC(10), FTITLE(15), IPVR(10)
C
C
C
      COMMON /COMBOD/CCL, INCLT, CLT, ALPHA, SUMDS(10), TLU(10,12),IND
     1               , ALPHAO, CNU(10), SMDSWF(10), MIO(10)
C
      COMMON /FILEID/ IFILE1, IFILE2, IFILE3, IFILE4, IFILE5,
     1                IFILE6, IFILE7, IFILE8, IFILE9, IFIL10,
     2                IFIL11, IFIL12, IFIL13, IFIL14, IFIL15
     3               ,IFIL16, IFIL17, IFIL18, IFIL19, IFIL20
      COMMON/PICTUR/VPERIN,XX,XMIN,EXEP,YY,YMIN,ORD
      COMMON /MDATA/ ISOL,IOFF,NONU,NBNU,IPRINT,MORE,M
      COMMON/ROTAT/NROT, ROTRAD(10)
C
C  SET UP THE VARIOUS STORAGE UNITS REQUIRED BY THE PROGRAM
      CALL FILES
   10 CONTINUE
      REWIND   IFILE1
      REWIND   IFILE2
      REWIND   IFILE3
      REWIND   IFILE4
      REWIND   IFILE8
      REWIND   IFILE9
      REWIND   IFIL10
      REWIND   IFIL11
      REWIND   IFIL12
      REWIND   IFIL13
      REWIND   IFIL14
      REWIND   IFIL15
      REWIND   IFIL16
      REWIND IFIL17
      CALL TSETV
C
C
      CALL  MAIN1
C
C
C  OBTAIN SIGMA SOLUTIONS
      ISIZE = 11413
      CALL SOLVE (NELTOT, M, ISIZE, ISOL)

C
      CALL TIMEV(T)
      WRITE(6,70) T
   70 FORMAT (1H0, 'SOLVE COMPLETE, READ FLOW TITLE + CONTROL CARD, ',
     1             'CALL COMBO, T = ', F9.3, 'SECONDS.')
C
      CALL MAIN3
C
```

```
                                                                   EXECC59
      IF (MORE .EQ. 1)  GO TO 10                                   EXECC60
      IF(VPERIN.GT.0.AND.IOFF.EQ.1)CALL PLOT(XX+4.,0.,-3)
      IF(VPERIN.GT.0.AND.IOFF.EQ.1)CALL PLOTID
      STOP                                                         EXECC61
      END                                                          EXECC62
```

```
SUBROUTINE TIMEV(T)
T=0.
RETURN
END
```

```
      SUBROUTINE  ASSEMB                                                 ASEMC01
C                                                                        ASEMC02
C  THIS ROUTINE READS IN NORMAL AND TANGENTIAL ONSET FLOWS               ASEMC03
C  IN ROW ORDER, AND ASSEMBLES THEM IN COLUMN ORDER AND WRITES           ASEMC04
C  THEM BACK OUT                                                         ASEMC05
C                                                                        ASEMC06
C  NORMAL ONSET FLOWS ON UNIT IF11                                       ASEMC07
C                                                                        ASEMC08
C  TANGENTIAL ONSET FLOWS ON UNIT IF12                                   ASEMC09
C                                                                        ASEMC10
C  THE NORMAL ONSET FLOWS ARE ALSO WRITTEN ON IFC4 (RHS TAPE)            ASEMC11
C  FOR USE IN MATRIX SOLUTION.                                           ASEMC12
C                                                                        ASEMC13
C                                                                        ASEMC14
C  ALSO, NON-UNIFORM ONSET FLOWS ARE READ IN AND WRITTEN ON UNITS.       ASEMC15
C                                                                        ASEMC16
C                                                                        ASEMC17
      DIMENSION  VN(500,12), VNUF(500), VTUF(500), I1(5), IE(5)          ASEMC18
      DIMENSION XO(500),YO(500),DS(500),SA(500),CA(500)                  ASEMC19
C                                                                        ASEMC20
      EQUIVALENCE (VN(1,1), VNUF(1)), (VN(1,2), VTUF(1))                 ASEMC21
C                                                                        ASEMC22
C                                                                        ASEMC23
C                                                                        ASEMC24
      COMMON /COMBOD/CCL, INCLT, CLT, ALPHA, SUMDS(10), TLU(10,12),IND   ASEMC25
     1              , ALPHAO, CNU(10), SMDSWF(10), MIO(10)               ASEMC26
C                                                                        ASEMC27
      COMMON /BFLAG/ IDR(10), INL(10), IFL(10), NL(10), LIFT(10),        ASEMC28
     1               IBMF(10), ISAV1(10), ISAV2(10), ISAV3(10),          ASEMC29
     2              BTITLE(10,  7), IBT, IPST, IBTOT, NELTOT,            ASEMC30
     3               ITRB(10), INMB(10), CHORDB(10), IBD(10), LIFTOT     ASEMC31
     4              ,IPRB(10), IFST(10), ISEC(10), FTITLE(15), IPVR(10)  ASEMC32
      COMMON /FILEID/  IF01, IF02, IF03, IFC4, IF05,                     ASEMC33
     1                      IF06, IF07, IF08, IF09, IF10,                ASEMC34
     2                  IF11, IF12, IF13, IF14, IF15                     ASEMC35
     3                ,IF16, IF17, IF18, IF19, IF20                      ASEMC36
      COMMON/ROTAT/NROT, ROTRAD(10)                                      ASEMC37
      COMMON /MDATA/ ISOL,IOFF,NONU,NBNU,IPRINT,MORE,M                   ASEMC38
      COMMON/ELDATA/ XO, YO, DS, SA, CA, CUPV(500), DL(500)              ASEMC39
C                                                                        ASEMC40
C  NORMAL ONSET FLOWS                                                    ASEMC41
      REWIND IF11                                                        ASEMC42
      DO 10 I = 1,NELTOT                                                 ASEMC43
   10 READ(IF11)  (VN(I,K), K=1,M )                                      ASEMC44
```

```
      REWIND IF11
      REWIND IF04
      MTOT = M
      IF (NONU .GT. 0)  MTOT = MTOT + NONU
      WRITE(IF04)  MTOT
      DO 20 K = 1,M
      CALL SAVE(IF11, 1, 1, NELTOT, VN(1,K), 1, VNA)
   20 CALL SAVE(IF04, 1, 1, NELTOT, VN(1,K), 1, VNA)
C
C  TANGENTIAL ONSET FLOWS
      REWIND IF12
      DO 30 I = 1,NELTOT
   30 READ(IF12)  (VN(I,K), K= 1,M )
      REWIND IF12
      DO 40 K = 1,M
   40 CALL SAVE(IF12, 1, 1, NELTOT, VN(1,K), 1, VNA)
C
C
C  CHECK IF NON-UNIFORM ONSET FLOWS INPUT
  340 IF (NONU .LE. 0)  RETURN
C
      DO 560 L = 1,NONU
      M = M + 1
C
C  PRESET ALL VELOCITIES TO ZERO
      DO 350 I = 1,NELTOT
      VNUF(I) = 0.0
  350 VTUF(I) = 0.0
      CALL SAVE(IF11, 1, 1, NELTOT, VNUF, 1, VN)
C
C
C  PRESET TLU ARRAYS TO ZERO
      DO 355 I = 1,IBTOT
  355 TLU(I,M) = 0.0
C
C
C  READ IN COMBINATION CONSTANTS FOR NON-UNIFORM FLOWS
      ITYP = 10
  360 READ(5,440) (CNU(I), I = 1, 6), ITYPE
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)
C
      DO 460 NP = 1,NBNU
      LB = 0
C  READ BODY CONTROL CARD FOR NON-UNIFORM FLOW
      ITYP = 11
      READ(5,370) IBOD, IN, IT,NN, (I1(I),IE(I), I = 1,5),CB,     ITYPE
  370 FORMAT (I1,1X3I1,  10(2XI3), F10.5, 5XI2)
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)
C
C  SEARCH FOR BODY ID AND SET LIFTING BODY COUNTER
      DO 380 IB = 1,IBTOT
      IF (LIFT(IB) .NE. 0)  LB = LB + 1
      IIB = IB
      IF (IBOD .EQ. IDB(IB))  GO TO 420
  380 CONTINUE
      WRITE(6,390) IBOD
  390 FORMAT(1H0, 'NON-UNIFORM FLOW INPUT, BODY WITH ID = ', I1,
```

```
     1                  ' DOES NOT EXIST.  RUN TERMINATED. ')
      STOP
C
  400 MO = MIO(IIB) - 1
      IF (NPOT .GT. 0)  GO TO 455
C
      DO 450 LL= 1,NN
      IO = MO + II(LL)
      IF = MO + IE(LL)
C
      IF (IN .EQ. 0)  GO TO 420
C  READ IN NORMAL VELOCITIES
      ITYP = 12
      M2 = IO - 1
  410 M1 = M2 + 1
      M2 = M1 + 5
      READ(5,440) (VNUF(I), I = M1,M2), ITYPE
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)
      IF (M2 .LT. IF)  GO TO 410
  420 IF (IT .EQ. 0)  GO TO 450
C
C  READ IN TANGENTIAL VELOCITIES
      ITYP = 13
      M2 = IO - 1
  430 M1 = M2 + 1
      M2 = M1 + 5
      READ(5,440) (VTUF(I), I = M1,M2), ITYPE
  440 FORMAT( 6F10.0, 10XI2)
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)
      IF (M2 .LT. IF)  GO TO 430
  450 CONTINUE
      GO TO 457
C
C  SPECIAL ROTATING FLOW - INPUT GENERATED
  455 CONTINUE
C  COUNTERS FOR MATRIX STORAGE
      IO = MO + 1
      IF = MO + NL(IIB)
C
C  COUNTER FOR BODY GEOMETRY
      JI = INL(IIB) - 1
C  ROTATION RADIUS
      ROTRAD(IIB) = CB
      CB = 1.0/CB
      DO 456 I = IO,IF
      JI = JI + 1
      VNUF(I) = -YO(JI)*SA(JI) - XO(JI)*CA(JI)
      VTUF(I) =  YO(JI)*CA(JI) - XO(JI)*SA(JI)
  456 CONTINUE
      WRITE(6,900) NONU,NROT,NBNU,L,NB,IO,IF
  900 FORMAT(1H0, 7HNONU = ,I3,5X7HNROT = ,I3,5X7HNBNU = ,I3,
     1  4HL = ,I3,5X5HNB = ,I3, 5X5HIO = ,I3,5X5HIF = ,I3)
  457 CONTINUE
C
C  ALL NON-U VELOCITIES FOR BODY ID=IBOD READ IN.
C
C  SCALE VELOCITIES
```

```
      IF (ABS(CB) .LT. 1.E-6)  GO TO 480
      DO 470 I = IO,IF
      VNUF(I) = VNUF(I)*CB
  470 VTUF(I) = VTUF(I)*CB
  480 CONTINUE
C
C  RESET TLU IF LIFTING BODY
      IF (LIFT(IIB) .EQ. 0)  GO TO 460
      IO = MO + 1
      IF = MO + NL(IIB)
      TLU(LB,M) = VTUF(IO) + VTUF(IF)
  460 CONTINUE
C
C  ALL VELOCITIES FOR A GIVEN NON-U FLOW READ IN.
      CALL SAVE(IF04, 1, 1, NELTOT, VNUF, 1, VN)
      CALL SAVE(IF12, 1, 1, NELTOT, VTUF, 1, VN)
C
C
  490 J2 = 0
  495 WRITE(6,500)
  500 FORMAT(1H1)
      WRITE(6,510) L, M
  510 FORMAT(1H0, 15X, 'NON-UNIFORM FLOW NUMBER ', I2,', M = ', I3//
     1          T15,'I', T27,' VN', T44,' VT',
     2          T75,'I', T87,' VN',T104,' VT')
      J1 = J2 + 1
      JMX = J1 + 49
      N2 = (NELTOT + 1 + J2)/2
      IF (JMX .GT. N2) JMX = N2
      J2 = JMX
      DO 530 J = J1,JMX
      J2 = J2 + 1
      IF (J2 .GT. NELTOT)  GO TO 540
      WRITE(6,520) J,VNUF(J),VTUF(J), J2, VNUF(J2),VTUF(J2)
  520 FORMAT(1H , 11XI3, 2(5XF12.6), 23XI3, 2(5XF12.6))
  530 CONTINUE
      IF (J2 .LT. NELTOT)  GO TO 495
      GO TO 550
  540 WRITE(6,520) J, VNUF(J), VTUF(J)
  550 CONTINUE
C
C
  560 [illegible]
C
C
      RETURN
      END
```

```fortran
      SUBROUTINE GETT(IU, IT, N1, A1, N2, A2)
C
      DIMENSION  A1(N1), A2(N2)
C
      GO TO (10,20,30,40), IT
C
C  READ A1
   10 READ(IU) A1
      RETURN
C
C  READ N1 AND A1
   20 READ(IU) N1, A1
      RETURN
C
C  READ A1 AND A2
   30 READ(IU) A1, A2
      RETURN
C
C  READ IDUM AND A1
   40 READ(IU) IDUM, A1
      RETURN
      END
```

```
      FUNCTION  ABFORM (XI, YI, DSI, SINI, COSI,
     1                  XJ, YJ, DSJ, SINJ, COSJ, BO)
C
C
C   THIS ROUTINE ACTUALLY CALCULATES THE INDUCED VELOCITY
C   ARRAY ELEMENTS A AND B.
C
C
      DATA E1,E2/169.0,11.111/,E0,EY/0.0001,0.01/
C
C
      DX = XI - XJ
      DY = YI - YJ
      ROSQ = DX**2 + DY**2
      DSJSQ = DSJ**2
C
      IF (ROSQ .LT. DSJSQ*E1)  GO TO 10
C
C   USE FAR FIELD FORMULAS
      VX = 2.*DSJ/ROSQ
      VY = VX*DY
      VX = VX*DX
      AO = -VX*SINI + VY*COSI
      ABFORM = AO
      BO =  VX*COSI + VY*SINI
      RETURN
C
C   USE NEAR FIELD FORMULAS
   10 X = DX*COSJ + DY*SINJ
      Y = DY*COSJ - DX*SINJ
      S = SINI*COSJ - COSI*SINJ
      C = COSI*COSJ + SINI*SINJ
C
      IF (ROSQ .GT. DSJSQ*E2)  GO TO 20
C
```

```
C  USE EXACT FORMULAS
      XB = X/DSJ
      YB = Y/DSJ
      RO = XB**2 + YB**2
      PP = XB**2 - YB**2
      R1 = RO + XB + 0.25
      R2 = RO - XB + 0.25
C
      VX = +ALOG((ROSQ+DSJ*X+0.25*DSJSQ)/(ROSQ-DSJ*X+0.25*DSJSQ))
      Y = Y*DSJ
      X = ROSQ - 0.25*DSJSQ
      VY = 2.0*ATAN2(Y,X)
C
      GO TO 30
C
C
C  USE MULTIPOLE FORMULAS
   20 AE = X*DSJ/ROSQ
      BE = Y*DSJ/ROSQ
      ASQ = X**2/ROSQ
      ESQ =DSJSQ/ROSQ
      VX  = 2.0*AE*(1.0 + (ASQ - 0.75)*ESQ/3.0)
      VY  = 2.0*BE*(1.0 + (ASQ - 0.25)*ESQ/3.0)
C
C
   30 CONTINUE
      ABFORM = -S*VX + C*VY
      BO = C*VX + S*VY
C
C
      RETURN
      END
```

```
      SUBROUTINE    MAFORM     ( M, NONU, NBNU, ISCL, IPRINT)          MAFO0001
C                                                                      MAFO0002
C                                                                      MAFO0003
C   THIS ROUTINE FORMS AND STORES MATRICES A AND B                     MAFO0004
C   ALSO CALCULATES AND STORES ALPHA AND CIRCULATORY ONSET VELOCITIES  MAFO0005
C                                                                      MAFO0006
C   THIS IS FIRST ATTEMPT AND IS SIMPLE ONE-TIME PASS.                 MAFO0007
C   CAPABILITY TO ONLY CHANGE SELECTED ARRAY ITEMS                     MAFO0008
C   WILL BE ADDED LATER.                                               MAFO0009
C                                                                      MAFO0010
C                                                                      MAFO0011
      REAL*4   N                                                       MAFO0012
C                                                                      MAFO0013
C                                                                      MAFO0014
      DIMENSION      A(500),    B(500),    XO(500),   YO(500),         MAFO0015
     1               DS(500),   SA(500),   CA(500),   BLU(500),        MAFO0016
     2               N(12),     T(12)                                  MAFO0017
C                                                                      MAFO0018
      COMMON /COMROD/CCL, INCLT, CLT, ALPHA, SUMDS(10), TLU(10,12),IND  MAFO0019
     1              , ALPHAO, CNU(10), SMDSWF(10), MIO(10)             MAFO0020
C                                                                      MAFO0021
      COMMON /BFLAG/ IDB(10), INL(10), IFL(10), NL(10), LIFT(10),      MAFO0022
     1               IBMF(10), ISAV1(10), ISAV2(10), ISAV3(10),        MAFO0023
     2              BTITLE(10,  7), IBT, IBST, IBTOT, NELTOT,          MAFO0024
     3               ITRB(10), INMB(10), CHORDB(10), IBD(10), LIFTOT   MAFO0025
     4              ,IPRB(10), IFST(10), ISEC(10), FTITLE(15), IPVR(10) MAFO0026
      COMMON /FILEID/  IF01, IF02, IF03, IF04, IF05,                   MAFO0027
     1                     IF06, IF07, IF08, IF09, IF10,               MAFO0028
     2                  IF11, IF12, IF13, IF14, IF15                   MAFO0029
     3                ,IF16, IF17, IF18, IF19, IF20                    MAFO0030
      COMMON/ROTAT/NROT, ROTRAD(10)                                    MAFO0031
C                                                                      MAFO0032
      COMMON/ELDATA/ XO, YO, DS, SA, CA, CURV(500), DL(500)            MAFO0033
      COMMON/GCOEFFS/ WF(500)                                          MAFO0034
C                                                                      MAFO0035
C                                                                      MAFO0036
C   BEGIN NEW CASE. II IS ROW COUNT, JJ IS COLUMN COUNT.               MAFO0037
      REWIND IF09                                                      MAFO0038
      REWIND IF10                                                      MAFO0039
      REWIND IF11                                                      MAFO0040
      REWIND IF12                                                      MAFO0041
      REWIND IF13                                                      MAFO0042
      M = LIFTOT + 2                                                   MAFO0043
      I2 = 0                                                           MAFO0044
      II = 0                                                           MAFO0045
      LP = 0                                                           MAFO0046
      INT = 0                                                          MAFO0047
      NROT = 0                                                         MAFO0048
C   INPUT VALUE OF NONU .GT. 6 IS USED TO FLAG                         MAFO0049
```

```
C   A ROTATING NON-UNIFORM FLOW
       IF (NONU .LE. 6)  GO TO 5
       NROT = I
       NONU = I
     5 CONTINUE
       DO 210 IIB = 1,IBTOT
C   CHECK IF BODY IIB IS STILL IN DATA SET.
       IF (IBMF(IIB) .LT. 0)  GO TO 210
       IWT = IWT + 1
C
C
       IO = INL(IIB)
       IF = IO + NL(IIB)- 1
       MIO(IIB) = II + 1
       DO 180 I = IO,IF
       JJ = 0
       K = 2
       II = II + 1
       IF (IPRINT .EQ. 2)
      1WRITE (6,10) II
    10 FORMAT(1H1, T4,'I = ',I3/1HO, T4,'J', T15,'AO', T31,'BO')
C
       DO 150 IB = 1,IBTOT
       IF (IBMF(IB) .LT. 0)  GO TO 150
C
C   COUNTER FOR ELEMENT GEOMETRY
       J = INL(IB) - 1
C   COUNTERS FOR A,B ARRAYS
       JI = JJ + 1
       JF = JJ + NL(IB)
C
C   JJ IS COUNTER FOR THE CURRENT ELEMENT
C
C   ZERO OUT A+B ARRAYS
       DO 20 JJ1 = JI,JF
       A(JJ1) = 0.0
    20 B(JJ1) = 0.0
C
       JJ = JI
       JJ1 = JJ + 1
       JJ3 = JJ1 + 1
       GO TO 40
    30 JJ3 = JJ + 1
    40 J = J + 1
       AO      =            ABFORM(XO(I),YO(I),DL(I),SA(I),CA(I),
      1                            XO(J),YO(J),DL(J),SA(J),CA(J),BO)
       B(JJ ) = B(JJ ) + BO
       A(JJ) = A(JJ) + AO
C
       IF (IPRINT .EQ. 2)
      1 WRITE (6,50) JJ, AO, BO
    50 FORMAT(1H , I3, 2(4XF12.6))
C
C
   110 JJ1 = JJ
       JJ = JJ + 1
       IF (JJ - JF)30,120,130
```

```
C
  120 JJ3 = JJ1 - 1
      GO TO 40
  130 JJ = JJ - 1
C
C
C  IF LIFTING BODY, SAVE FIRST AND LAST B. ALSO CALCULATE N AND T.
      IF (LIFT(IB) .EQ. 0)  GO TO 150
      VN = 0.0
      VT = 0.0
      SMDSWF(IB) = 0.0
      IF ((IWT .EQ. 1) .AND. (I .EQ. IO))
     1CALL WEIGHT(SUMDS(IB), DS, JI, JF, WF, IPVR(IB))
      DO 140 J = JI,JF
      SMDSWF(IB) = SMDSWF(IB) + DS(J) * WF(J)
      VN = VN + B(J)*WF(J)
  140 VT = VT + A(J)*WF(J)
C
      K = K + 1
      N(K) = VN
      T(K) = VT
C
C
  150 CONTINUE
C
C  A COMPLETE ROW OF BOTH A AND B HAS BEEN GENERATED.
C  SAVE A ON UNIT 9, A AND B ON UNIT 10.
      CALL SAVE(IF10, 1, 1, JJ, A, 1, VN)
      CALL SAVE(IF10, 1, 1, JJ, B, 1, VN)
C
C
C  SET ALPHA ONSET FLOWS
C  ALPHA = 0
      N(1) = SA(I)
      T(1) = CA(I)
C
C  ALPHA = 90
      N(2) =-CA(I)
      T(2) = SA(I)
C
C
      DO 160 K = 1,M
      JJ = JJ + 1
  160 A(JJ) = N(K)
C
C  THE A-ARRAY IS SAVED ON IF09 IN AUGMENTED FORM
      CALL SAVE(IF09, 1, 1, JJ, A, 1, VN)
C
C
C  ALSO SET UP TLU ARRAY
      IF (LIFT(IIB) .EQ. 0)  GO TO 203
      IF (I .NE. IO)  GO TO 201
      LB = LB + 1
      DO 200 K = 1,M
  200 TLU(LB,K) = T(K)
C
  201 IF (I .NE. IF)  GO TO 203
```

```
      DO 202 K = 1,M
  202 TLU(LP,K) = TLU(LP,K) + T(K)
  203 CONTINUE
C
C
C  SAVE NORMAL AND TANGENTIAL ONSET VELOCITIES.
C  NORMALS ON UNIT 11,  TANGENTIALS ON UNIT 12
C
      WRITE(IF11)  N
      WRITE(IF12)  T
C
C  IF I=IO AND LIFTING BODY, SET BLU
      IF (I .NE. IO)  GO TO 180
      IF (LIFT(IIB) .EQ. 0)  GO TO 180
      DO 170 J = 1, NELTOT
  170 BLU(J) = B(J)
C
C
  180 CONTINUE
C  IF LIFTING BODY, SUM BLU
      IF (LIFT(IIB) .EQ. 0)  GO TO 210
      DO 190 J = 1, NELTOT
  190 BLU(J) = BLU(J) + B(J)
C
C
C  STORE BLU ON UNIT 13
      CALL SAVE(IF13, 1, 1, NELTOT, BLU, 1, VN)
C
  210 CONTINUE
C
C
C
C
  240 CONTINUE
      IF (IPRINT .NE. 2)  GO TO 340
      WRITE (6,250)
  250 FORMAT(1H1)
      WRITE (6,250)
      REWIND IF10
      JF = NELTOT
      DO 330 J = 1,JF
      CALL GETT(IF10, 1,     JF, A, 1, VN)
      CALL GETT(IF10, 1,     JF, B, 1, VN)
      WRITE (6,300)  J
  300 FORMAT(1H0, T4,'A(', I3,', J)'/)
      WRITE (6,310) (A(I),I=1,JF)
  310 FORMAT(8(4XF12.6))
C
      WRITE (6,320)  J
  320 FORMAT(1H0, T4,'B(', I3,', J)'/)
      WRITE (6,310) (B(I),I=1,JF)
C
  330 CONTINUE
C
C
  340 CONTINUE
C

C
C
      RETURN
      END
```

```
      SUBROUTINE  MAIN3
C
      COMMON /BFLAG/ IDB(10), INL(10), IFL(10), NL(10), LIFT(10),
     1               IBMF(10), ISAV1(10), ISAV2(10), ISAV3(10),
     2               BTITLE(10,  7), IBT, IBST, IBTCT, NELTOT,
     3               ITRB(10), INMB(10), CHOPDB(10), IBD(10), LIFTOT
     4               ,IPRB(10), IFST(10), ISEC(10), FTITLE(15), IPVR(10)
C
C
C
      COMMON /COMBOD/CCL, INCLT, CLT, ALPHA, SUMDS(10), TLU(10,12),IND
     1              , ALPHAO, CNU(10), SMDSWF(10), MIO(10)
C
      COMMON /FILEID/ IFILE1, IFILE2, IFILE3, IFILE4, IFILE5,
     1                IFILE6, IFILE7, IFILE8, IFILE9, IFIL10,
     2                IFIL11, IFIL12, IFIL13, IFIL14, IFIL15
     3               ,IFIL16, IFIL17, IFIL18, IFIL19, IFIL20
      COMMON /MDATA/ ISOL,IOFF,NONU,NBNU,IPRINT,MORE,M
C
C   CALCULATE COMBINATION CONSTANTS
      CALL  COMBO (NELTOT, LIFTOT, M, NONU)
C
      CALL TIMEV(T)
      WRITE(6,80) T
   80 FORMAT (1H0, 'COMBO COMPLETE, CALL FLOWS, T = ',F9.3,'SECONDS.')
C
      CALL FLOWS(NELTOT, M, IPRINT)
      CALL TIMEV(T)
      WRITE(6,90) T
   90 FORMAT(1H0, 'FLOWS COMPLETE, T = ', F9.3, 'SECONDS.')
C
C  CHECK FOR OFFBODY POINTS
      IF (IOFF .NE. 1)  GO TO 110
C
      CALL  OFFBOD(NELTOT, M, CHOPDB, IDB, IBTOT)
      CALL TIMEV(T)
      WRITE(6,100) T
  100 FORMAT(1H0, 'OFFBODY POINTS COMPLETE, T = ', F9.3,' SECONDS.')
C
C
  110 CONTINUE
C
C
      RETURN
      END
```

```
      SUBROUTINE MIS1 ( A, N, ND, B, MD, NERR, D )
C
C     A REAL*4      SUBROUTINE TO
C     INVERT A MATRIX AND/OR SOLVE SIMULTANEOUS EQUATIONS
C
C     INPUT,
C     A = NAME OF INPUT MATRIX, DIMENSIONED A(ND,ND)
C     N = IS THE ORDER OF THE MATRIX A
C     ND = IS THE DIMENSION OF THE SQUARE ARRAY A
C     B = NAME OF INPUT MATRIX, DIMENSIONED B(ND,MD)
C         ( B(ND) IS ALLOWED IF MD=1 )
C     MD = IS THE NUMBER OF COLUMNS IN THE RECTANGULAR ARRAY B
C     D = SCALE FACTOR FOR VALUE OF DETERMINANT  (=1., FOR NO SCALING)
C
C     OUTPUT,
C     A(I,J) = GARBAGE
C     B(I,J) = A-INVERSE * B
C     NERR  =  0--OK,  1--A IS SINGULAR
C     D = SCALED VALUE OF DETERMINANT
C
      REAL*4     A,B,D,AIJMAX,ARAT
      DIMENSION A(ND,ND), B(ND,MD)
      EQUIVALENCE  (L,FL), (K,FK)
      DATA  EPS/1.E-25/
C     START REDUCTION OF MATRIX A
C
      DO 80  I=1,N
C
C     SEARCH FOR MAXIMUM ELEMENT IN ITH ROW OF A-MATRIX
C
      AIJMAX = A(I,1)
      JMAX = 1
      DO 10  J=2,N
      IF (  ABS(A(I,J)) .LE.   ABS(AIJMAX)) GO TO 10
      AIJMAX = A(I,J)
      JMAX = J
   10 CONTINUE
C
C     IF AIJMAX IS ZERO, THE MATRIX IS SINGULAR
C
      IF (ABS(AIJMAX) .GT. EPS)  GO TO 20
      D =  0.0E0
      NERR =  1
      RETURN
C
C     NORMALIZE ITH ROW BY AIJMAX (JMAX ELEMENT OF ITH ROW)
C
   20 DO 30  J=1,N
   30 A(I,J) = A(I,J) / AIJMAX
      D = D*AIJMAX
C
C     NORMALIZE ITH ROW OF B
C
      DO 40  J=1,MD
   40 B(I,J) = B(I,J) / AIJMAX
```

```
C
C     USE ROW TRANSFORMATIONS TO GET ZEROS ABOVE AND BELOW THE JMAX
C     ELEMENT OF THE ITH ROW OF A.  APPLY SAME ROW TRANSFORMATIONS
C     TO THE B MATRIX.
C
      DO 70  K=1,N
      IF (K .EQ. I) GO TO 70
      ARAT = -A(K,JMAX)
      DO 50  J=1,N
      IF (ABS(A(I,J)) .LT. EPS)  GO TO 50
      A(K,J) = ARAT * A(I,J) + A(K,J)
   50 CONTINUE
      A(K,JMAX) =  0.0E0
      DO 60  J=1,MD
      IF (ABS(B(I,J)) .LT. EPS)  GO TO 60
      B(K,J) = ARAT * B(I,J) + B(K,J)
   60 CONTINUE
   70 CONTINUE
C
C     STORE ROW COUNTER (I) IN TOP ELEMENT OF JMAX COLUMN. THUS,
C     THE TOP ROW OF A WILL CONTAIN THE LOC OF THE PIVOT (UNITY)
C     ELEMENT OF EACH COLUMN (AFTER REDUCTION).
C
      L = I
   80 A(1,JMAX) = FL
C                  THIS STORES INTEGER I IN TOP ROW OF A
C
C     THE REDUCTION OF A IS NOW COMPLETE.  PERFORM ROW INTERCHANGES
C     AS INDICATED IN THE FIRST ROW OF A.
C
      DO 120  I=1,N
      K = I

   90 FK = A(1,K)
C                  THIS PUTS THE INTEGER VALUE IN A INTO K
      IF (K-I)90,120,100
C
C     IF K(1,I) IS LESS THAN I, THEN THAT ROW HAS ALREADY BEEN
C     INVOLVED IN AN INTERCHANGE, AND WE USE K(1,K) UNTIL WE GET
C     A VALUE OF K GREATER THAN I  (CORRESPONDING TO A ROW STORED
C     BELOW THE ITH ROW.  (CLEAR AS MUD)
C
  100 DO 110  J=1,MD
      ARAT =  B(I,J)
      B(I,J) = B(K,J)
  110 B(K,J) = ARAT
      D = -D
  120 CONTINUE
      NERR = 0
      RETURN
      END
```

```
      SUBROUTINE MIS2 ( A, N, ND, B, MD, MX, NERR, D)
C
C     A REAL*4     SUBROUTINE TO
C     INVERT A MATRIX AND/OR SOLVE SIMULTANEOUS EQUATIONS
C
C     INPUT,
C     A = NAME OF INPUT MATRIX, DIMENSIONED A(ND,ND)
C     N = IS THE ORDER OF THE MATRIX A
C     ND = IS THE DIMENSION OF THE SQUARE ARRAY A
C     B = NAME OF INPUT MATRIX, DIMENSIONED B(ND,MD)
C         ( B(ND) IS ALLOWED IF MD=1 )
C     MD = IS THE NUMBER OF COLUMNS IN THE RECTANGULAR ARRAY B
C     D = SCALE FACTOR FOR VALUE OF DETERMINANT  (=1., FOR NO SCALING)
C
C     OUTPUT,
C     A(I,J) = GARBAGE
C     B(I,J) = A-INVERSE * B
C     NERR  =  0--OK,  1--A IS SINGULAR
C     D = SCALED VALUE OF DETERMINANT
C
      REAL*4     A,B,D,AIJMAX,ARAT
      DIMENSION A(ND,ND), B(ND,MX)
      EQUIVALENCE  (L,FL), (K,FK)
      DATA  EPS/1.E-25/
C     START REDUCTION OF MATRIX A
C
      DO 80  I=1,N
C
C     SEARCH FOR MAXIMUM ELEMENT IN ITH ROW OF A-MATRIX
C
      AIJMAX = A(I,1)
      JMAX = 1
      DO 10  J=2,N
      IF (  ABS(A(I,J)) .LE.   ABS(AIJMAX)) GO TO 10
      AIJMAX = A(I,J)
      JMAX = J
   10 CONTINUE
C
C     IF AIJMAX IS ZERO, THE MATRIX IS SINGULAR
C
      IF (ABS(AIJMAX) .GT. EPS)  GO TO 20
      D =  0.0E0
      NERR =  1
      RETURN
C
C     NORMALIZE ITH ROW BY AIJMAX (JMAX ELEMENT OF ITH ROW)
C
   20 DO 30  J=1,N
   30 A(I,J) = A(I,J) / AIJMAX
      D = D*AIJMAX
C
C     NORMALIZE ITH ROW OF B
C
      DO 40  J=1,MD
   40 B(I,J) = B(I,J) / AIJMAX
C
```

```
C     USE ROW TRANSFORMATIONS TO GET ZEROS ABOVE AND BELOW THE JMAX
C     ELEMENT OF THE ITH ROW OF A.  APPLY SAME ROW TRANSFORMATIONS
C     TO THE B MATRIX.
C
      DO 70  K=1,N
      IF (K .EQ. I) GO TO 70
      ARAT = -A(K,JMAX)
      DO 50  J=1,N
      IF (ABS(A(I,J)) .LT. EPS)  GO TO 50
      A(K,J) = ARAT * A(I,J) + A(K,J)
   50 CONTINUE
      A(K,JMAX) =  0.0E0
      DO 60  J=1,MD
      IF (ABS(B(I,J)) .LT. EPS)  GO TO 60
      B(K,J) = ARAT * B(I,J) + B(K,J)
   60 CONTINUE
   70 CONTINUE
C
C     STORE ROW COUNTER (I) IN TOP ELEMENT OF JMAX COLUMN. THUS,
C     THE TOP ROW OF A WILL CONTAIN THE LOC OF THE PIVOT (UNITY)
C     ELEMENT OF EACH COLUMN (AFTER REDUCTION).
C
      L = I
   80 A(1,JMAX) = FL
C                 THIS STORES INTEGER I IN TOP ROW OF A
C
C     THE REDUCTION OF A IS NOW COMPLETE.  PERFORM ROW INTERCHANGES
C     AS INDICATED IN THE FIRST ROW OF A.
C
      DO 120  I=1,N
      K = I
   90 FK = A(1,K)
C                 THIS PUTS THE INTEGER VALUE IN A INTO K
      IF (K-I)90,120,100
C
C     IF K(1,I) IS LESS THAN I, THEN THAT ROW HAS ALREADY BEEN
C     INVOLVED IN AN INTERCHANGE, AND WE USE K(1,K) UNTIL WE GET
C     A VALUE OF K GREATER THAN I  (CORRESPONDING TO A ROW STORED
C     BELOW THE ITH ROW.  (CLEAR AS MUD)
C
  100 DO 110  J=1,MD
      ARAT =  B(I,J)
      B(I,J) = B(K,J)
  110 B(K,J) = ARAT
      D = -D
  120 CONTINUE
      NERR = 0
      RETURN
      END
```

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```
      SUBROUTINE  OFFBOD(N, M, CHORDB, IDB, IBTOT)
C
      DIMENSION  X(100), Y(100), TITLE(7)
     1          ,CHORDB(10), IDB(10)
      COMMON/COMBOD/CCL,INCLT,CLT,ALPHA,SUMDS(10),ILU(10,12),IND
     1                , ALPHAO, CNU(10), SMDSWF(10), MIO(10)
C
C  READ IN OFFBODY POINTS (IN BLOCKS OF UP TO 100)
   10 CALL OFFPTS(NO, X, Y, TITLE, LAST, CHORDB, IDB, IBTOT)
C
C  NOW CALCULATE VX AND VY
      CALL  VXYOFF(N, M, NO, X, Y)
C
C
C  PRINT OFFBODY POINTS AND VELOCITIES
      CALL VPROFF(N, M, NO, X, Y, TITLE, IND)
C
C  CHECK IF MORE POINTS AND CYCLE IF SO
      IF (LAST .NE. 1)  GO TO 10
C
C
      RETURN
      END
```

```
      SUBROUTINE    PRINTG (IP, N, ID, BTITLE)
C
C  THIS SUBROUTINE WRITES OUT THE BODY COORDINATE DATA.
C
C
      DIMENSION BTITLE ( 7), A(2)
C
      COMMON /GEOMD/ X(500), Y(500)
C
      DATA A(1),A(2)/'UNTR',' TR'/
C
C
      J2 = 0
   10 WRITE (6,30)
      WRITE (6,20) A(IP), ID, BTITLE
   20 FORMAT(1H0,15XA4,'ANSFORMED COORDINATE DATA FOR BODY ID = ',I2,
     1       ',   ',  7A4//T15,'I', T27,'X(I)', T44,'Y(I)',
     2                  T75,'I', T87,'X(I)',T104,'Y(I)')
   30 FORMAT (1H1)
C
      J1 = J2 + 1
      JMX = J1 + 49
      N2 = (N + 1 + J2)/2
      IF (JMX .GT. N2)   JMX = N2
      J2 = JMX
      DO 50 J = J1,JMX
      J2 = J2  + 1
      IF (J2 .GT. N) GO TO 60
      WRITE (6,40) J, X(J), Y(J), J2, X(J2), Y(J2)
   40 FORMAT (1H ,11XI3, 2(5XF12.6), 23XI3, 2(5XF12.6))
   50 CONTINUE
C
C
      IF (J2 .LT. N)  GO TO 10
      RETURN
C
C
   60 WRITE (6,40) J, X(J), Y(J)
C
      RETURN
      END
```

```
      SUBROUTINE    PRNTEL
C
C
      DIMENSION AN(10)
      REAL NEW,NO,NCHGE
C
      COMMON /BFLAG/ IDB(10), INL(10), IFL(10), NL(10), LIFT(10),
     1               IBMF(10), ISAV1(10), ISAV2(10), ISAV3(10),
     2              BTITLE(10, 7), IBT, IBST, IBDTCT, NELTOT,
     3              ITRB(10), INMB(10), CHORDB(10), IBD(10),LIFTOT
     4              ,IPRB(10), IFST(10), ISEC(10), FTITLE(15), IPVR(10)
C
C
      DATA NEW,OLD,YES,NO,SAVED,BLANK/' NEW',' OLD ',' YES',' NO ',
     1     ' S ','    '/,CHGE,NCHGE/'CHGE',' NC '/,AN/'  0 ','  1 ',
     2     '  2 ','  3 ','  4 ','  5 ','  6 ','  7 ','  8 ','  9 '/

     3     , AP, AL/ '  P ', '  L '/
C
C   WRITE HEADING FOR BODY GEOMETRY SUMMARY
      WRITE (6,10)
   10 FORMAT (1H1, T51,'BODY  GEOMETRY  SUMMARY'//
     1          1H0,T33,'BODY    LIFT',T99,'SIGMA',
     2              T114,'ELEMENT  STORAGE'/
     3          T6,'BODY  DESCPIPTION',T34,'ID      TYPE',
     4          T50,'N/O   SID   TFORM  NORM       CHORD        TYPE',
     5          T97,'F  C   S  C    N/O     FIRST     NO.')
C
C
      IBDTOT = 0
      NELTOT = 0
      LIFTCT = 0
      DO 150 IB = 1,IBT
      IF (IBD(IB) .GE. 6)  GO TO 150
C
      IF (IBD(IB) - 3)20,20,30
   20 A2 = NEW
      A3 = BLANK
      IF (ISAV3(IB) .GE. 0)   A3 = SAVED
      GO TO 40
C
   30 A2 = OLD
      IN = ISAV1(IB) + 1
      A3 = AN(IN)
C
   40 A4 = NO
      A5 = NO
      IF (ITRB(IB) .EQ. 1)    A4 = YES
      IF(INMB(IB) .EQ. 1)     A5 = YES
C
      A1 = NO
      IF (LIFT(IB) .EQ. 1)    A1 = YES
C
      A6 = OLD
      IF (IBMF(IB) - 1)70,50,60
   50 A6 = NEW
      GO TO 70
   60 A6 = CHGE
C
C
```

```
   70 A7 = AP                                                          PRNLCC
      I8 = 1                                                           PRNL06
      I9 = 1                                                           PRNL06
      I10= 1                                                           PRNL06
      I11= 1                                                           PRNL06
C                                                                      PRNL06
      IF (IPRP(IB) .NE. 1)  A7 = AL                                    PRNL06
      IF (IFST(IB) - 2)80,90,100                                       PRNL06
   80 I9 = 0                                                           PRNL06
      IF (IFST(IB) .EQ. 1)  GO TO 100                                  PRNL06
   90 I8 = 0                                                           PRNL0
  100 IF (ISEC(IB) - 2)110,120,130                                     PRNL0
  110 I11 = 0                                                          PRNL0
      IF (ISEC(IB) .EQ. 1)  GO TO 130                                  PRNL0

  120 I10 = 0                                                          PRNL0
  130 CONTINUE                                                         PRNL0
C                                                                      PRNL0
      IBDTOT = IBDTOT + 1                                              PRNL0
      NELTOT = NELTOT + NL(IB)                                         PRNL0
      IF (LIFT(IB) .EQ. 1)  LIFTOT = LIFTOT + 1                        PRNL0
      WRITE (6,140)  (BTITLE(IB,I), I=1,7), IDB(IB), A1, A2, A3,       PRNL0
     1               A4, A5, CHORDB(IB), A7, I8, I9, I10, I11, A6,     PRNL0
     2               INL(IB), NL(IB)                                   PRNL0
  140 FORMAT (1H0,      7A4, 4XI2, 5XA4, 4XA4, 2XA4, 3XA4, 3XA4, 2XF12.6,PRNL0
     1         3XA4, 3XI1, 2XI1, 3XI1, 2XI1, 3XA4, 5XI4, 4XI4)         PRNL0
C                                                                      PRNL0
  150 CONTINUE                                                         PRNL0
C                                                                      PRNL0
C                                                                      PRNL0
      WRITE (6,160) IBDTOT, NELTOT                                     PRNL0
  160 FORMAT (1H0, ///T53, 'TOTAL NUMBER OF BODIES = ',I3/             PRNL0
     1         1H0, //T51,'TOTAL NUMBER OF ELEMENTS = ',I3)            PRNL0
C                                                                      PRNL0
C                                                                      PRNL0
      RETURN                                                           PRNL0
      END                                                              PRNL0
```

```
      FUNCTION   RMAX (NL, X, Y, TMAX)
C
      DIMENSION     X(NL), Y(NL)
C
      ID = 1
      I1 = NL/2
      I3 = I1 + ID
      R1 = SQRT((X(I1)-X(1))**2 + (Y(I1)-Y(1))**2)
      R2 = SQRT((X(I3)-X(1))**2 + (Y(I3)-Y(1))**2)
      IF (R2 .GT. R1)  GO TO 20
C
      R3 = R1
      I3 = I1
      ID = -ID
C
   10 R1 = R2
      R2 = R3
   20 I3 = I3 + ID
      R3 = SQRT((X(I3)-X(1))**2 + (Y(I3)-Y(1))**2)
      IF (R3 .GT. R2) GO TO 10
C
C  CALCULATE ANGLES
      I2 = I3 - ID
      I1 = I2 - ID
      T1 = ARSIN((Y(I1)-Y(1))/R1)
      T2 = ARSIN((Y(I2)-Y(1))/R2)
      T3 = ARSIN((Y(I3)-Y(1))/R3)
C
C  CALCULATE MAXIMUM RADIUS (CHORD)
      T2 = T2 - T1

      T3 = T3 - T1
      A3 = T2*T3*(T3 - T2)
      R2 = R2 - R1
      R3 = R3 - R1
      A1 = (R3*T2 - R2*T3)/A3
      A2 = (R2*T3**2 - R3*T2**2)/A3
C
C
      RMAX = -0.25*A2**2/A1 + R1
      TMAX = -0.5*A2/A1 + T1
C
      RETURN
      END
```

```
      SUBROUTINE  SAVE(IU, IT, N, N1, A1, N2, A2)
C
      DIMENSION  A1(N1), A2(N2)
C
      GO TO (10,20,30,40), IT
C
C  WRITE A1
   10 WRITE(IU) A1
      RETURN
C
C  WRITE N AND A1
   20 WRITE(IU)  N, A1
      RETURN
C
C  WRITE A1 AND A2
   30 WRITE(IU) A1, A2
      RETURN
C
C  WRITE N, A1, AND A2
   40 WRITE(IU) N, A1, A2
      RETURN
      END
```

```
      SUBROUTINE  SOLVIT (A, ND, MD, KD, NI, MM, NC, NO, *)
C
C
C          ****    ***/  *******  *****  *          ***/          *
C          *   *  *  /*     *       *    *          *  /*      ******
C     **** ****   * / *     *       ***  *          * / *  ****   *  *
C          *      */  *     *       *    *          */  *         ***
C          *      /***      *       *    *****      /***          *  *
C
C            D I R E C T   M A T R I X   S O L U T I O N
C
C     WRITTEN BY J. L. HESS * PROGRAMMED BY T. M. RIDDELL
C
      DIMENSION  A ( KD )
C
      LOGICAL  LAST
C
      CALL TIMEV(AA1)
      IF( AA1 .EQ. 0. )        CALL TSETV
      N = ND
      M = MD
      KORE = KD
      NPM = N + M
      IF (MAX0(3 * NPM, M * N) .GT. KORE) RETURN 1
      MT = MM
      REWIND MT
      NIN = NI
      REWIND NIN
      NOUT = NO
      REWIND NOUT
      MP1 = M + 1
      NN = N
      NEL = NPM
C
C - - CALCULATE THE MAXIMUM NO. OF ROWS, "K"
C
   10 K = (KORE - NEL) / NEL
C
C - - TEST TO SEE IF THE REST OF THE MATRIX WILL FIT IN CORE
C
      LAST = K .GE. NN
      IF (LAST) K = NN
C
C - - READ "K" ROWS OF THE AUGMENTED "A" MATRIX
C
   20 NT = 0
      DO 30 IB = 1, K
      NS = NT + 1
      NT = NT + NEL
   30 CALL  GETT(NIN, 1, NEL, A(NS), 1, AA2)
C
C - - CHECK TO SEE IF WE WERE UNLUCKY ENOUGH TO END UP WITH ONLY ONE ROW
C
      IF (K .EQ. 1) GO TO 90
C
C - - "K" IS GREATER THAN "1" SO WE CAN START THE TRIANGULARIZATION
C
      NELP1 = NEL + 1
      NS = - NEL
      NELP2 = NELP1 + 1
C
C - - FORM THE "TRAPEZOIDAL" ARRAY  (8)
C
      DO 40 IB = 2, K
      NP = NELP2 - IB
```

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```
      NS = NS + NELP1
      NT = NS
      DO 40 IO = IB, K
      NT = NT + NEL
      MN = NT
      NB = NS
      A(NT) = (-A(NT)) / A(NS)
      DO 40 NF = 2, NP
      MN = MN + 1
      NB = NB + 1
   40 A(MN) = A(MN) + A(NT) * A(NB)
      IF (LAST) GO TO 90
C
C - - WRITE THE 'TRAPEZOIDAL' MATRIX ON TAPE
C
      NT = 0
      NP = NEL
      NS = - NEL
      DO 50 IO = 1, K
      NS = NS + NELP1
      NT = NT + NEL
      CALL  SAVE(MT, 2, NP, NP, A(NS), 1, AA2)
   50 NP = NP - 1
      NF = NP - M
      NS = KORE - NEL + 1
C
C - - READ ANOTHER ROW
C
      DO 80 IO = 1, NP
      CALL  GETT(NIN, 1, NEL, A(NS), 1, AA2)
C
C - - MODIFY THIS ROW BY THE 'TRAPEZOIDAL' ARRAY
C
      NT = 1
      MN = NS
      DO 70 IB = 1, K
      NB = NT
      NF = MN + 1
      A(MN) = (-A(MN)) / A(NT)
      DO 60 NN = NF, KORE
      NB = NB + 1
   60 A(NN) = A(NN) + A(MN) * A(NB)
      MN = NF
   70 NT = NT + NELP1
C
C - - WRITE THE MODIFIED ROW ON TAPE
C
      NN1 = KORE - MN + 1
   80 CALL  SAVE(NOUT, 1, NN1, NN1, A(MN), 1, AA2)
      REWIND NOUT
      REWIND NIN
C
C - - SWITCH THE TAPES
C
      NT = NIN
      NIN = NOUT
      NOUT = NT
```

```
C
C - - RE-CALCULATE ROW LENGTH AND LOOP BACK
C
      NEL = NEL - K
      NN = NEL - M
      GO TO 10
C
C - - REWIND ALL TAPES
C
   90 REWIND MT
      REWIND NIN
      REWIND NOUT
C
C - - CONDENSE THE MATRIX
C
      NN = NEL
      NL = NEL + 1
      IF (K .EQ. 1) GO TO 110
      NS = 1
      NT = NEL
      DO 100 IP = 2, K
      NS = NS + NELP1
      NT = NT + NEL
      DO 100 IO = NS, NT
      A(NL) = A(IO)
  100 NL = NL + 1
  110 N1 = KORE - K * M + 1
C
C - - THERE, NOW WE CAN START THE BACK-SOLUTION
C * * NOTE..THE FIRST AVAILABLE LOCATION FOR THE SOLUTIONS IS A(N1)
C
      NREM = N
      NEL = NPP
      LAST = K .EQ. N
      NPASS = 0
C
C - - SOLVE FOR THE ANSWERS CORRESPONDING TO 'K' ROWS
C
  120 KM1 = K - 1
      KP1 = K + 1
      NS = NL - MP1
      NPASS = NPASS + 1
      DO 150 MN = 1, M
      NF = NS + MN
      A(NF) = A(NF) / A(NS)
      NT = NS
      IF (KM1 .EQ. 0) GO  TO 150
      DO 140 IB = 1, KM1
      NF = NF - IB - M
      NT = NT - MP1 - IB
      SUM = 0.0
      NP = NF
      N2 = MP1 + IB
      DO 130 IO = 1, IB
      NN = NT + IO
      NP = NP + N2 - IO
  130 SUM = SUM + A(NN) * A(NP)
```

```
  140 A(NF) = (A(NF) - SUM) / A(NT)
  150 CONTINUE
C
C - - MOVE THE SOLUTIONS TO CONTIGUOUS LOCATIONS STARTING AT A(N1)
C
      N1 = KORE + 1
      DO 170 NN = 1, K
      DO 160 MN = 1, M
      NL = NL - 1
      N1 = N1 - 1
  160 A(N1) = A(NL)
  170 NL = NL - NN
C
C - - WRITE THE SOLUTIONS ON TAPE
C
      WRITE (NIN) K
      NS = N1 - 1
      DO 180 MN = 1, M
      NT = NS + MN
  180 WRITE (NIN ) (A(IO), IO = NT, KORE, M)
C
C - - TEST IF THIS IS THE LAST PASS
C
      IF (LAST) GO TO 260
C
C - - WE MUST NOW MODIFY THE TRIANGULAR MATRIX TO REFLECT THE EFFECT OF
C     THE SOLUTIONS OBTAINED SO FAR  (EC 21)
C * * NOTE..LOCATIONS A(1) TO A(N1-1) ARE NOW FREE TO USE
C
C - - CALCULATE THE NEXT VALUES OF *NEL* AND *NREM*
C
      NELOLD = NEL
      KOLD = K
      NEL = NEL - K
      NREM = NREM - K
C
C$$$$ CALCULATE NEW K.  B AND C (REAL) WILL ALWAYS BE INTEGERS.
C     K WILL BE CALCULATED REAL AND TRUNCATED - - GOOD.
C
      B = 1 + 2*M
      C = 2*(KOLD*(M+1) - KORE)
      K = (-B + SQRT(B**2 - 4*C))/2.0
      NROW = NREM - K + 1
      IF (K .LT. NREM) GO TO 190
      LAST = .TRUE.
      NROW = 1
      K = NREM
  190 NS = 1
      NT = NELOLD + 1
C
C - - READ IN THE ROWS TO BE MODIFIED
C
      DO 250 IB = 1, NREM
      NT = NT - 1
      IF (IB .LE. NROW) GO TO 200
      NS = NS + NN
      NT = NT + NN
```

```
  200 CALL  GETT(MT, 2, NN, A(NS), 1, AA2)
      NP = N1 - 1
      NF = NT - M - KM1
      NN = NN - KOLD
      DO 220 MN = 1, M
      N2 = NF
      NA = NP + MN
      NB = NA
      SUM = 0.0
      DO 210 IO = 1, KOLD
      SUM = SUM + A(N2) * A(NA)
      N2 = N2 + 1
  210 NA = NA + M
      N2 = N2 + MN - 1
  220 A(N2) = A(N2) - SUM
C
C - - WRITE THE MODIFIED ROW ON TAPE OR CONDENSE THE ROW
C
      NL = NT - M + 1
      IF (IP .GE. NROW) GO TO 230
      NF = NL - KP1
      NN1 = NF - NS + 1
      NN2 = NT - NL + 1
      CALL  SAVE(NOUT, 4, NN, NN1, A(NS), NN2, A(NL))
      GO TO 250
  230 NF = NL - KOLD
      DO 240 MN = NL, NT
      A(NF) = A(MN)
  240 NF = NF + 1
  250
      REWIND MT
      REWIND NOUT
C
C - - SWITCH THE TAPES
C
      NT = MT
      MT = NOUT
      NOUT = NT
C
C - - LOOP BACK THRU THE SOLUTION
C
      NL = NF
      GO TO 120
C
C - - STAPT TO WRAP IT UP
C
  260 REWIND NIN
      N2 = N
C
C * * NOTE.. AT THIS POINT ALL LOCATIONS A(1) THRU A(KORE) ARE FREE
C
      DO 280 IP = 1, NPASS
      RFAD (NIN) K
      N1 = N2 - K + 1
      NS = N1
      NT = N2
C
```

```
C - - READ IN THE SOLUTIONS
C
      DO 270 IO = 1, M
      NM = NT - NS + 1
      CALL  GETT(NIN, 1,NM, A(NS), 1, AA2)
      NT = NT + N
  270 NS = NS + N
  280 N2 = N1 - 1
C
C - - WRITE THE SOLUTIONS ON TAPE
C
      NT = 0
      DO 290 IO = 1, M
      NS = NT + 1
      NT = NT + N
  290 CALL  SAVE(NW, 1, N, N, A(NS), 1, AA2)
C
      CALL TIMEV(AA2)
      BB = (AA2 - AA1) / 60.
      WRITE (6,300) N, N, M, BB
  300 FORMAT (4H0THE I5, 2H X I5, 12H MATRIX WITH I4, 35H RIGHT SIDES WA
     IS SOLVED DIRECTLY IN F8.3, 9H MINUTES. )
      RETURN
      END
```

```
      SUBROUTINE    TYPE(IGOOD, IBAD)                                   TYPE0001
C                                                                       TYPE0002
C                                                                       TYPE0003
      WRITE(6,10)  IGOOD, IBAD                                          TYPE0004
   10 FORMAT (1H1, 'AN ATTEMPT HAS BEEN MADE TO READ A TYPE ',I2,       TYPE0005
     1            ' CARD, HOWEVER A TYPE ',I2, ' CARD WAS FOUND.'/1H0,  TYPE0006
     2            'CHECK OVER THE INPUT DATA CARD SEQUENCE FOR ',       TYPE0007
     3            'COMPATIBILITY WITH DESIRED OPTIONS.')                TYPE0008
C                                                                       TYPE0009
C                                                                       TYPE0010
   20 WRITE (6,30)                                                      TYPE0011
   30 FORMAT (1H0, 'BECAUSE OF THE ABOVE ERROR, THIS RUN IS TERMINATED')TYPE0012
C                                                                       TYPE0013
      STOP                                                              TYPE0014
      END                                                               TYPE0015
```

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```
      SUBROUTINE WEIGHT ( SUMDS, DS, JI, JF, WF, IPVOR)
C
      DIMENSION     DS (1),    WF (1)
      IF ( IPVOR .EQ. 0)  GO TO 20
C
      WRITE ( 6, 1000 )
 1000 FORMAT  ( 1H1, 'VORTICITY WEIGHTING FUNCTION = S/L*(1 - S/L)'//)
C
      S1 = 0.0
      SD1= 0.0
      SDN= 1.0
C
      DO 10 J = JI, JF
      SD = DS (J) / (2.0 * SUMDS)
      S  = S1 + SD
      S1 = S  + SD
      WF (J) = (S - SD1) * (SDN - S)
   10 CONTINUE
C
      WRITE ( 6, 1010 ) ( WF (J), J = JI, JF )
 1010 FORMAT  ( 1H , 6F18.6 )
C
      RETURN
C
   20 CONTINUE
      DO 30 J = JI, JF
   30 WF (J) = 1.0
C
      WRITE ( 6, 1020 )
 1020 FORMAT  ( 1H1, 'VORTICITY WEIGHTING FUNCTION CONSTANT = 1.0' //)
C
      RETURN
      END
```

```
      FUNCTION  XYFORM (XI, YI, DSI, SINI, COSI,
     1                  XJ, YJ, DSJ, SINJ, COSJ, BO)
C
C
C  THIS ROUTINE ACTUALLY CALCULATES THE INDUCED VELOCITY
C  ARRAY ELEMENTS A AND B.
C
C
      DATA E1,E2/169.0,11.111/,E0,EY/0.0001,0.01/
C
C
      DX = XI - XJ
      DY = YI - YJ
      ROSQ = DX**2 + DY**2
      DSJSQ = DSJ**2
C
      IF (ROSQ .LT. DSJSQ*E1)  GO TO 10
C
C  USE FAR FIELD FORMULAS
      VX = 2.*DSJ/ROSQ
      VY = VX*DY
      VX = VX*DX
      AO = -VX*SINI + VY*COSI
      XYFORM = AO
      BO =  VX*COSI + VY*SINI
      RETURN
C
C  USE NEAR FIELD FORMULAS
   10 X = DX*COSJ + DY*SINJ
      Y = DY*COSJ - DX*SINJ
      S = SINI*COSJ - COSI*SINJ
      C = COSI*COSJ + SINI*SINJ
```

```
C
      IF (ROSQ .GT. DSJSQ*E2) GO TO 20
C
C  USE EXACT FORMULAS
      XB = X/DSJ
      YB = Y/DSJ
      RO = XB**2 + YB**2
      RD = XB**2 - YB**2
      R1 = RO + XB + 0.25
      R2 = RO - XB + 0.25
C
      VX = +ALOG((ROSQ+DSJ*X+0.25*DSJSQ)/(ROSQ-DSJ*X+0.25*DSJSQ))
      Y = Y*DSJ
      X = ROSQ - 0.25*DSJSQ
      VY = 2.0*ATAN2(Y,X)
C
      GO TO 30
C
C
C  USE MULTIPOLE FORMULAS
   20 AE = X*DSJ/ROSQ
      BE = Y*DSJ/ROSQ
      ASQ = X**2/ROSQ
      BSQ =DSJSQ/ROSQ
      VX  = 2.0*AE*(1.0 + (ASQ - 0.75)*BSQ/3.0)
      VY  = 2.0*BE*(1.0 + (ASQ - 0.25)*BSQ/3.0)
C
C
   30 CONTINUE
      XYFORM = -S*VX + C*VY
      RO = C*VX + S*VY
C
C
      RETURN
      END
```

```
      SUBROUTINE     ELFORM (SUMDS)
C
      DIMENSION X(500),Y(500),XO(500),YO(500),DS(500),SA(500),CA(500),
     1          IDB(10), INL(10), IFL(10), NL(10), LIFT(10), IBHF(10),
     2          ISAV1(10), ISAV2(10), ISAV3(10), TTITLE( 7),
     3          BTITLE(10, 7), SUMDS(10)
C
C
C
      COMMON /ELDATA/ XO, YO, DS, SA, CA, CURV(500), DL(500)
      COMMON/GCOEFS/ WF(500)
C
      COMMON /FILEID/ IF1, IF2, IF3, IF4, IF5, IF6, IF7, IF8, IF9,
     1  IF10, IF11, IF12, IF13, IF14, IF15, IF16, IF17, IF18, IF19, IF20
C
      COMMON /PFLAG/ IDB, INL, IFL, NL, LIFT, IBHF, ISAV1, ISAV2,
     1                ISAV3, BTITLE, IBT, IBST
     2               ,IBDTOT, NELTOT, ITRB(10), INHB(10), CHORDB(10),
     3                IBD(10), LIFTOT
     4               ,IPRB(10), IFST(10), ISEC(10), FTITLE(15), IPVR(10)
C
      COMMON /GEOMD/ X, Y
C
C
      DATA        IBMAX,MAXEL/    10, 500/, DR/1.74532925E-2/
     1    , EPS/1.0E-7/
C
C
C
C
C
      ISAVU = IF8
```

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```
C
C
C  READ IN BODY TITLE AND CONTROL CARD
   10 ITYP = 1
      READ (5,20) ID, ISV, ILIFT, TTITLE
     1            ,IPARA, IFIRST, ISECND
     2            ,ITR, INORM, IBOD, IDOLD, IPVOR, LAST
     3            ,ITYPE
      IFIRST = 0
      ISECND = 0
      IPARA  = 0
C
   20 FORMAT (3(I1,2X), 1X7A4, 5X9(I1,2X), 1XI1)
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)
C
C  READ IN COORDINATE TRANSFORMATION CARD IF REQUIRED
      ITYP = 2
      CHORD = 0.0
      IF (ITR.EQ.0 .OR. ITR.EQ.2 .OR. ITR.EQ.4) GO TO 40
      READ (5,30) CHORD, XMULT, YMULT, DX, DY, THETA, XTO, YTO, ITYPE
   30 FORMAT (7(F8.0,1X), F8.0, I1)
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)
C
C  DETERMINE STORAGE SEQUENCE
      IF(IBOD.LT.1.OR.IBOD.GT.6) GOTO 49
   40 GO TO (60,70,100,140,140,210), IBOD
C
49    WRITE (6,50) IBOD
   50 FORMAT (1H1,'THE OPTION IBOD = ',I3,' IS NOT LEGITIMATE.')
      GO TO 640
C
C  NEW GEOMETRY, START A NEW SEQUENCE
   60 IBT = 0
      IFST = 0
      IBS = 0
      REWIND ISAVU
C
C  NEW GEOMETRY, CONTINUE SEQUENCE
   70 IBT = IBT + 1
      IF (IBT .GT. 10) GO TO 80
      IB = IBT
      IBMF(IB) = 1
      GO TO 250
   80 WRITE (6,90) IBT, IBMAX
   90 FORMAT (1H1, 'ATTEMPTED TO LOAD THE ',I2,'TH BODY.
     1            'ALLOWABLE NUMBER OF BODIES IS ',I3)
      GO TO 640
C
C  NEW GEOMETRY, OLD SEQUENCE
  100 IF (IBT .LE. 0) GO TO 120
      DO 110 IB = 1,IBT
      IF (IDB(IB) .EQ. IDOLD) GO TO 240
  110 CONTINUE
  120 WRITE (6,130) IBOD, IDOLD
  130 FORMAT (1H1,'OPTION IBOD = ',I3,', GEOMETRY WITH ID = ', I3,
     1            ' NOT PREVIOUSLY LOADED.')
      GO TO 640
```

```
C
C  OLD GEOMETRY, OLD (OR CONTINUE) SEQUENCE
  140 IF (IBT .LE. 0) GO TO 120
      DO 150 IB = 1,IBT
      IF (IDB(IB) .EQ. IDOLD) GO TO 160
  150 CONTINUE
      GO TO 120
C
C  DESIRE OLD GEOMETRY. IF SAVED, RETRIEVE
  160 IF (ISAV3(IB) .LT. 0)  GO TO 190
      IBS = ISAV3(IB)
      REWIND ISAVU
      DO 170 I = 1,IBS
      LX = ISAV2(IBS)
      CALL  GETT(ISAVU, 3, LX, X, LX, Y)
  170 CONTINUE
      IF (IBOD .EQ. 5)  GO TO 180
      IBMF(IB) = 2
      GO TO 360
  180 IBT = IBT + 1
      IF (IBT .GT. 10) GO TO 80
      IB = IBT
      IBMF(IB) = 1
      ISAV1(IB) = IDOLD
      ISAV3(IB) = -1
      GO TO 360
C
  190 WRITE (6,200) IBOD, IDOLD
  200 FORMAT (1H1,'OPTION IBOD = ',I3,', GEOMETRY WITH ID = ',I3,
     1              ' NOT PREVIOUSLY SAVED.')
      GO TO 640
C
C  DELETE AN EXISTING BODY
  210 IF (IBT .LE. 0) GO TO 120
      DO 220 IB = 1,IBT
      IF (IDB(IB) .EQ. IDOLD) GO TO 230
  220 CONTINUE
  230 IBMF(IB) = -1
      GO TO 600
C
C  NEW GEOMETRY TO BE READ IN.
  240 IBMF(IB) = 2
C  POSITION SAVE UNIT IF NEW GEOMETRY TO BE SAVED.
  250 IF (ISV .EQ. 0) GO TO 270
      IF (IBS .EQ. IBST) GO TO 270
      DO 260 IT = IBS,IBST
      LX = ISAV2(IT)
  260 CALL  GETT(ISAVU, 3, LX, X, LY, Y)
  270 CONTINUE
C
C  CHECK IF ELLIPSE TO BE GENERATED
      IF (ITR .GT. 1)  GO TO 320
C
C  DATA ON UNIT 5.  X-COORDS FIRST
      L = 0
      ITYP = 3
  280 READ (5,290)  (X(L+I), I=1,6), INO, ISTAT, ITYPE
```

```
  290 FORMAT (6F10.0, 4XI1, 2XI1, 3XI1)
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)
      IF (INO .LE. 0  .OR.  INO .GT. 6) INO = 6
      L = L + INO
      IF (ISTAT .EQ. 0) GO TO 280
      LX = L
C
C  NOW READ IN Y-COORDS
      L = 0
      ITYP = 4
  300 READ (5,290)  (Y(L+I), I=1,6), INO, ISTAT, ITYPE
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)
      IF (INO .LE. 0  .OR.  INO .GT. 6) INO = 6
      L = L + INO
      IF (ISTAT .EQ. 0) GO TO 300
      LY = L
C
C  CHECK FOR INPUT CONSISTENCY
      IF (LY .EQ. LX) GO TO 350
      WRITE (6,310) LY, LX
  310 FORMAT (1H1,'THE NUMBER OF Y-COORDINATES (',I3,') READ DOES ',
     1            'NOT EQUAL THE NUMBER OF X-COORDINATES READ.(',I3,')')
      GO TO 640
C
C  ELLIPSE TO BE GENERATED.  READ IN DEFINITION CARD.
  320 ITYP = 5
      READ (5,330) LX, ELPSTH, ITYPE
  330 FORMAT (2XI3, 5XF10.5, 51XI1)
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)
      ITR = ITR - 2
      IF (ITR .NE. 1)  ITR = 0
C
      DANGLE = 6.2831853072/(LX - 1)
      ANGLE = DANGLE
      DO 340 I = 1,LX
      ANGLE = ANGLE - DANGLE
      X(I) = COS(ANGLE)
  340 Y(I) = SIN(ANGLE)*ELPSTH
C
C
C  SAVE THE BASIC GEOMETRY IF REQUESTED
  350 ISAV3(IP) = -1
      IF (ISV .EQ. 0)  GO TO 360
C
C
      IBST = IBST + 1
      IBS = IBST
      ISAV1(IB) = ID
      ISAV2(IBS) = LX
      ISAV3(IB) = IBS
      CALL  SAVE(ISAVU, 3, 1, LX, X, LX, Y)
C
C
  360 CONTINUE
C
C  WRITE OUT BASIC GEOMETRY DATA
      IP = 1
```

```
      CALL PRINTG (IP, LX, ID, TTITLE)
C
C
C  TRANSFORM COORDINATES IF REQUESTED
      IF (ITR .EQ. 1) GO TO 370
      IF (INORM .EQ. 0) GO TO 410
      XMULT = 0.0
      YMULT = 0.0
      XTO = 0.0
      YTO = 0.0
      THETA = 0.0
      DX = 0.0
      DY = 0.0
  370 CONTINUE
C
      IF (ABS(XMULT) .LT. EPS)      XMULT = 1.0
      IF (ABS(YMULT) .LT. EPS)      YMULT = 1.0
      XSF = XMULT
      YSF = YMULT
      IF (INORM .EQ. 0)  GO TO 390
C
      IF (ABS(CHORD) .GT. EPS)  GO TO 380
      CHORD = RMAX (LX, X, Y, THAX)
  380 XSF = XSF/CHORD
      YSF = YSF/CHORD
C
  390 COST = COS(THETA*DR)
      SINT = SIN(THETA*DR)
      DO 400 I = 1,LX
      XTOD = X(I) - XTO
      YTOD = Y(I) - YTO
      X(I) = (XTO + XTOD*COST - YTOD*SINT + DX)*XSF
      Y(I) = (YTO + YTOD*SINT + YTOD*COST + DY)*YSF
  400 CONTINUE
C
C
C  FORM ELEMENT DATA FOR THIS BODY.
C  DEFINE STORAGE LOCATIONS AND CROSS CHECK
  410 IST = 0
      IF (IB .GT. 1)  IST = IFL(IB-1)
      LX1 = LX-1
C  FIRST CHECK AGAINST EXCEEDING MAXIMUM STORAGE
      IF ((IST + LX1) .LE. MAXEL)  GO TO 430
      WRITE (6,420) LX1, ID, MAXEL
  420 FORMAT (1H1,'THE NUMBER OF ELEMENTS (',I4,') FOR BODY ID = ',I2,
     1        ' WILL EXCEED ALLOWABLE STORAGE (',I4,') WHEN ADDED ',
     2        'TO THE DATA SET.')
      GO TO 640
C
C  NOW, IF USING OLD STORAGE SEQUENCE, CHECK THAT NEW GEOMETRY
C  DOES NOT RUN INTO THE NEXT BODY.
  430 IF (IP .EQ. IBT) GO TO 450
      IF ((IST + LX1) .LT. INL(IB+1))  GO TO 460
      WRITE (6,440) LX1, ID, NL(IB), IDOLD
  440 FORMAT (1H1,'THE NUMBER OF ELEMENTS (',I4,') FOR THE NEW BODY ',
     1        'ID = ',I2,' EXCEEDS THE NUMBER (',I4,') FOR THE BODY ',
     2        'IT IS REPLACING, IDOLD = ',I2)
```

```
      GO TO 640
C
C
  450 INL(IB) = IST + 1
      IFL(IB) = IST + LX1
  460 NL(IB) = LX1
      LIFT(IB) = ILIFT
      IDB(IB) = ID
      ITRB(IB) = ITR
      INMB(IB) = INORM
      IBD(IB)  = IBOD
      CHORDB(IB) = CHORD
      IPRB(IB) = IPARA
      IFST(IB) = IFIRST
      ISEC(IB) = ISECND
      IPVR(IB) = IPVOR
C
      DO 470 I = 1,7
  470 BTITLE(IB,I) = TTITLE(I)
C
C  CALCULATE ELEMENT DATA AND PRINT RESULTS.
C
      DO 480 I = 2,LX
      IST = IST + 1
      XO(IST) = 0.5*(X(I) + X(I-1))
      YO(IST) = 0.5*(Y(I) + Y(I-1))
      XD = X(I) - X(I-1)
      YD = Y(I) - Y(I-1)
      DL(IST)  = SQRT(XD**2 + YD**2)
      DS(IST)  = DL(IST)
      SA(IST)  = YD/DL(IST)
      CA(IST)  = XD/DL(IST)
      CURV(IST) = 0.0
  480 CONTINUE
C
      I1 = INL(IB)
      I2 = IFL(IB)
C
C  PRINT ELEMENT DATA
  560 I = 1
      WRITE (6,610)  IDB(IB),TTITLE
      WRITE (6,620)  I, X(I), Y(I)
      LCNT = 1
      SUMDS(IB) = 0.0
      ALPH1 = 0.0
      DO 580 IST = I1, I2
      I = I + 1
      IF (LCNT .LT. 49)  GO TO 570
      LCNT = 0
      WRITE (6,610)  IDB(IB),TTITLE
  570 CONTINUE
      SUMDS(IB) = SUMDS(IB) + DS(IST)
      ALPHA = ATAN2(SA(IST), CA(IST))/DR
      ALPH1 = ALPHA
      CURV2 = 2.0*CURV(IST)
      WRITE (6,630) XO(IST), YO(IST), DL(IST), DS(IST),
     1          SA(IST), CA(IST), CURV2
```

```
      WRITE (6,620)  I, X(I), Y(I)
      LCNT = LCNT + 2
  580 CONTINUE
C
C
      WRITE (6,590)  SUMDS(IB)
  590 FORMAT(1H0, T13, 'SUMDS = ', F12.6)
C
C
C
C  CHECK IF MORE BODIES TO BE INPUT
  600 IF (LAST .NE. 1)  GO TO 10
C
C
C  WRITE OUT BODY SUMMARY
      CALL PRNTEL
C
      GO TO 660
C
C
C
  610 FORMAT (1H1, 20X,'ELEMENT COORDINATE DATA FOR BODY ID = ', I2,
     1        ',   ',  7A4//T10,'I', T22,'X(I)', T39,'Y(I)', T56,'DL',
     2        T73,'DS', T86,' SIN(ALF) ', T105,'COS(ALF)',
     3        T121,'CURVATURE'//)
C
  620 FORMAT (1H , 6XI3, 2(5XF12.6))
C
  630 FORMAT (1H , 9X,    7(5XF12.6))
C
  640 WRITE (6,650)
  650 FORMAT (1H0, 'BECAUSE OF THE ABOVE ERROR, THIS RUN IS TERMINATED')
      STOP
C
C
  660 CONTINUE
C
      RETURN
      END
```

```
      SUBROUTINE   FILES
      COMMON /FILEID/ IFILE1, IFILE2, IFILE3, IFILE4, IFILE5,
     1                IFILE6, IFILE7, IFILE8, IFILE9, IFIL10,
     2                IFIL11, IFIL12, IFIL13, IFIL14, IFIL15
     3               ,IFIL16, IFIL17, IFIL18, IFIL19, IFIL20
C
C  IFILE1, IFILE2, AND IFILE3 ARE TEMPORARY SCRATCH UNITS USED IN QUASI
      IFILE1 = 18
      IFILE2 = 2
      IFILE3 = 3
C  IFILE4 IS INPUT FILE FOR RIGHT SIDE MATRIX IN QUASI
      IFILE4 = 4
C
C  IFILE5, IFILE6, AND IFILE7 ARE STANDARD SYSTEM I/O
      IFILE5 = 5
      IFILE6 = 6
      IFILE7 = 7
C
C  IFILE8 IS INPUT GEOMETRY SAVE UNIT
      IFILE8 = 8
C
C  IFILE9 IS MATRIX A(I,J)
C  IFIL10 IS MATRIX B(I,J)
      IFILE9 = 9
      IFIL10 = 10
C  IFIL11 IS INDUCED NORMAL VELOCITY  N(I).
C  IFIL12 IS INDUCED TANGENTIAL VELOCITY T(I)
      IFIL11 = 11
      IFIL12 = 12
C
C  IFIL13 IS SPECIAL B ROWS FOR LIFTING BODIES, BLB(J)
      IFIL13 = 13
C
C  IFIL14 CONTAINS SIGMA SOLUTIONS ON OUTPUT FROM QUASI
      IFIL14 = 14
C
C  IFIL15 CONTAINS BOTH UPPER AND LOWER TRIANGULAR MATRICES
C  ON OUPUT FROM QUASI
      IFIL15 = 15
C
C  IFIL16 IS USED FOR OFFBODY CALCULATIONS.  /ELDATA/  AND  /GCOEFS/
C  ARE STORED  (SEE  SUBROUTINE ELFORM).
      IFIL16 = 16
C
C  IFIL17 IS USED TO SAVE SURFACE COORDS (X, Y, AND DS)  AT WHICH
C  THE FLOW VELOCITY IS ASSUMED TO ACT.
      IFIL17 = 17
C
C  IFILS 18, 19, AND 20 HAVE NOT BEEN ASSIGNED.
C
      RETURN
      END
```

```
      SUBROUTINE QUASI (A,ND,MD,KD,NI,MM,NO,NAT,NW,LTAPE,RHSTAP,*)
C
C
C           ****    ***/   *******  *****  *        ***/         *
C           *   *  *  /*      *       *    *       *  /*      ******
C    ****   ****   * / *      *      ***   *       * / *  ****  *  *
C           *      */  *      *       *    *       */  *        ***
C           *      /***       *       *    *****   /***         *  *
C
C             D I R E C T   M A T R I X   S O L U T I O N
C
C*** ***LTAPE IS THE TAPE THE L(I,J) MATRIX WILL BE PUT ON
C*** ***RHSTAP IS THE TAPE THAT THE RIGHT HAND SIDES ARE INPUT ON
      INTEGER RHSTAP
C*** ***NATAPE IS A SCRATCH TAPE
C*** ***THE TRIANGULAR MATRIX EXCEPT FOR THE LAST K ROWS WILL BE KEPT ON
C*** ***TAPE MM
C*** ***THE LAST K ROWS OF THE TRIANGULAR MATRIX WILL BE PUT ON THE
C*** ***LTAPE BEHIND THE RHS MATRIX
C
C     COMPLEX A,SUM
      DIMENSION  A ( KD )
C
      LOGICAL JPASS1
      LOGICAL  LASTRS
      LOGICAL  LAST
C
      CALL TIMEV(AA1)
   10 CONTINUE
      REWIND LTAPE
      NATAPE = NAT
      REWIND NATAPE
      N = ND
      KORE = KD
C*** *  RHSTAP = 0 IF THERE ARE NO RHS TO BE PROCESSED THIS RUN
      IF(RHSTAP .NE. 0 )GO TO 20
      MRHS = 0
      GO TO 30
   20 REWIND RHSTAP
      READ(RHSTAP)MRHS
   30 M = KORE / N  -  1
      MMAX = MIN0(MRHS,M)
      NPM = N + MMAX
      IF( (3*NPM) .GT. KORE )RETURN 1
      M = 0
      NPM = N
      MT = MM
      REWIND MT
      NIN = NI
      REWIND NIN
      NOUT = NO
      REWIND NOUT
      MP1 = M + 1
      NN = N
      NEL = NPM
      NLCNT = 0
```

```
C                                                                       QUASC57
C - - CALCULATE THE MAXIMUM NO. OF ROWS, 'K'                             QUASC58
C                                                                       QUASC59
   40 K = (KORE - NEL) / NEL                                            QUASC60
C                                                                       QUASC61
C - - TEST TO SEE IF THE REST OF THE MATRIX WILL FIT IN CORE            QUASC62
C                                                                       QUASC63
      LAST = K .GE. NN                                                  QUASC64
      IF( .NOT. LAST ) GO TO 50                                         QUASC65
      K = NN                                                            QUASC66
      B = 3 + MMAX*2                                                    QUASC67
      C = 2 * (1 + MMAX - KORE )                                        QUASC68
      KTEMP = ( -B + SQRT(B**2  -  4 * C )   )  / 2                     QUASC69
      IF(KTEMP .GE. K)GO TO 50                                          QUASC70
C                                                                       QUASC71
C***   *  WE MUST REDUCE THE FINAL K                                    QUASC72
C                                                                       QUASC73
      K = KTEMP                                                         QUASC74
      LAST = .FALSE.                                                    QUASC75
C                                                                       QUASC76
C - - READ 'K' ROWS OF THE AUGMENTED 'A' MATRIX                         QUASC77
C                                                                       QUASC78
   50 NT = 0                                                            QUASC79
      DO 60 IB = 1, K                                                   QUASC80
      NS = NT + 1                                                       QUASC81
      NT = NT + NEL                                                     QUASC82
   60 CALL  GETT(NIN, 1, NEL, A(NS), 1, AA2)                            QUASC83
C                                                                       QUASC84
C - - CHECK TO SEE IF WE WERE UNLUCKY ENOUGH TO END UP WITH ONLY ONE ROWQUASC85
C                                                                       QUASC86
      IF (K .EQ. 1) GO TO 130                                           QUASC87
C                                                                       QUASC88
C - - 'K' IS GREATER THAN '1' SO WE CAN START THE TRIANGULARIZATION     QUASC89
C                                                                       QUASC90
      NELP1 = NEL + 1                                                   QUASC91
      NS = - NEL                                                        QUASC92
      NELP2 = NELP1 + 1                                                 QUASC93
C                                                                       QUASC94
C - - FORM THE 'TRAPEZOIDAL' ARRAY  (B)                                 QUASC95
C                                                                       QUASC96
      DO 70 IB = 2, K                                                   QUASC97
      NP = NELP2 - IB                                                   QUASC98
      NS = NS + NELP1                                                   QUASC99
      NT = NS                                                           QUAS100
      DO 70 IO = IB, K                                                  QUAS101
      NT = NT + NEL                                                     QUAS102
      MN = NT                                                           QUAS103
      NB = NS                                                           QUAS104
      A(NT) = A(NT) / A(NS)                                             QUAS105
      DO 70 NF = 2, NP                                                  QUAS106
      MN = MN + 1                                                       QUAS107
      NB = NB + 1                                                       QUAS108
   70 A(MN) = A(MN) - A(NT) * A(NB)                                     QUAS109
C*** ***WRITE PART OF THE LMATRIX ON LTAPE    (TRIANGULAR PART)         QUAS110
      WRITE (LTAPE)K                                                    QUAS111
      NLCNT = NLCNT + 1                                                 QUAS112
      LREC =NELP1                                                       QUAS113
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
      KM1 = K - 1
      DO 80 IP = 1,KM1
      LEND = LBEG + IB- 1
      CALL SAVE(LTAPE, 1, IB, IB, A(LBEG), 1, AA2)
   80 LBEG = LBEG + NN
C
C - - WRITE THE 'TRAPEZOIDAL' MATRIX ON TAPE
C
      NT = 0
      NP = NEL
      NS = - NEL
      DO 90 IO = 1, K
      NS = NS + NELP1
      NT = NT + NEL
      CALL  SAVE(MT, 2, NP, NP, A(NS), 1, AA2)
   90 NP = NP - 1
      IF (LAST) GO TO 130
      NP = NP - M
      NS = KORE - NEL + 1
C
C - - READ ANOTHER ROW
C
      DO 120 IO = 1, NP
      CALL  GETT(NIN, 1, NEL, A(NS), 1, AA2)
C
C - - MODIFY THIS ROW BY THE 'TRAPEZOIDAL' ARRAY
C
      NT = 1
      MN = NS
      DO 110 IP = 1, K
      NB = NT
      NF = MN + 1
      A(MN) = A(MN) / A(NT)
      DO 100 NN = NF, KORE
      NB = NB + 1
  100 A(NN) = A(NN) - A(MN) * A(NB)
      MN = NF
  110 NT = NT + NELP1
C
C - - WRITE THE MODIFIED ROW ON TAPE
C
C*** ***WRITE REST OF LMATRIX ON LTAPE
      MNM1 = MN - 1
      NN1 = MNM1 - NS + 1
      CALL  SAVE(LTAPE, 1, NN1, NN1, A(NS), 1, AA2)
      NN1 = KORE - MN + 1
  120 CALL  SAVE(NOUT, 1, NN1, NN1, A(MN), 1, AA2)
      REWIND NOUT
      REWIND NIN
C
C - - SWITCH THE TAPES
C
      NT = NIN
      NIN = NOUT
      NOUT = NT
C
C - - RE-CALCULATE ROW LENGTH AND LOOP BACK
```

```
C
      NEL = NEL - K
      NN = NEL - M
      GO TO 40
C
C - - REWIND ALL TAPES
C
  130 REWIND KIN
      REWIND NOUT
C
  140 N1 = KORE - K * M + 1
      REWIND LTAPE
      REWIND MT
C*** ***CALCULATE THE NUMBER OF COLUMNS TO BRING OFF OF THE RHS TAPE
      MTOTAL = 0
      M = MMAX
      IF(M .EQ. 0)GO TO 520
C*** ***MTOTALIS THE TOTAL NUMBER OF RHS COLUMNS ALREADY BROUGHT IN
  150 MTOTAL = MTOTAL + M
      LASTRS = MTOTAL.GE. MRHS
      MTOTAL = MTOTAL - M
      IF (LASTRS)M = MRHS - MTOTAL
      MTOTAL = MTOTAL + M
C*** ***BRING IN M COLUMNS OF RHS
      KINIT = KORE - (M*N)
      IINIT = KINIT
      NBEG = KINIT + 1
      NEND = KINIT+ N
      DO 160 J =1,M
      CALL  GETT(RHSTAP, 1, N, A(NBEG), 1, AA2)
      NBEG = NEND + 1
  160 NEND = NEND + N
C*** ***BRING IN L(I,J) MATRIX AND APPLY IT TO RHS
      NBEG = 1 + KINIT
      NEND = 1 + (M-1) * N + KINIT
      KSUM = 0
C*** ***DO TRIANGULAR SECTION OF LMATRIX
  170 READ (LTAPE)K
C*** ***KSUM IS THE TOTAL NUMBER OF L ROWS THAT WILL
C*** ***BE READ AFTER THIS TRIANGULAR SECTION IS FINISHED
      KSUM = KSUM + K
      KM1 = K - 1
C***    ***NOTE THAT KM1 CAN'T BE 0 SINCE K CAN'T BE 1 AND STILL HAVE SOM
C***    ***ON THE LTAPE
      DO 200  I = 1,KM1
      NBEG = NBEG + 1
      NEND = NEND + 1
C*** ***READ 1 ROW OF L(I,J) FROM LTAPE---K-1 TIMES---EACH TIME
C*** ***STARTING WITH L(1)
      CALL  GETT(LTAPE, 1, I, A, 1, AA2)
      JCNT = -1
C*** ***REDUCE THE RHS BY GOING ACROSS A SOLUTION ROW (WHICH
C*** ***ARE NOT IN CONSECUTIVE ORDER, BUT A(1), A(N+1), A(2N+1) ETC.)
      DO 190 NPP = NBEG,NEND,N
      JCNT = JCNT + 1
      SUM = 0.0
      NROW = KINIT + ( JCNT * N )
```

```
      DO 180 NN=1,I
      NROW = NROW + 1
  180 SUM = SUM + ( A(NN)*A(NROW))
  190 A(NPP) = A(NPP) - SUM
  200 CONTINUE
      IF (KSUM .EQ. N)GO TO 240
C*** ***KSUM = N IF YOU HAVE READ ENTIRE LMATRIX AND
C*** ***THERE IS NO CONSTANT SECTION LEFT
      NTBEG = NBEG
      NTEND = NEND
      KSUMP1 = KSUM + 1
C*** ***READ REST OF LROWS 1 ROW AT A TIME FOR CONSTANT SECTION
      DO 230 I=KSUMP1,N
      NTBEG = NTBEG + 1
      NTEND = NTEND + 1
      CALL  GETT(LTAPE, 1, K, A, 1, AA2)
      JCNT = -1
C*** ***PARTIALLY  REDUCE A RHS ACROSS A RHS ROW BY APPLYING K NUMBER
C*** ***OF L(I,J) S
      DO 220 NPP = NTBEG,NTEND,N
      JCNT = JCNT + 1
      SUM = 0.0
      NROW = KINIT + ( JCNT * N )
      DO 210 NN = 1,K
      NROW = NROW + 1
  210 SUM = SUM + ( A(NN) * A(NROW) )
  220 A(NPP) = A(NPP) - SUM
  230 CONTINUE
      NBEG = NBEG + 1
      NEND = NEND + 1
C*** ***KINIT IS HOW FAR DOWN A COLUMN OF RHS TO START MULTIPLYING BY
C*** ***L(I,J) AT EACH PASS THROUGH
      KINIT = KINIT + K
C*** ***IF KSUMP1 = N THERE ARE NO MORE L(I,J)'S LEFT
      IF(KSUMP1 .LT. N)GO TO 170
C*** ***WRITE OUT ALL BUT LAST K ROWS OF RHS IN ROW ORDER ON NATAPE
  240 B = 4*M + 3
      C = -2 * KORE
      K = (  -B   +  SQRT( B**2   -   4*C )   )/2
      IF(K .GT. ND) K = ND
      KF = K
      KM1 = K - 1
      KLEFT = N - KF + IINIT
      INITP1 = IINIT + 1
      NEND = (M-1)*N + IINIT
      DO 250 NPP = INITP1,KLEFT
      NEND = NEND + 1
  250 WRITE(NATAPE) ( A(J),J=NPP,NEND,N)
      REWIND NATAPE
C*** ***JPASS1 IS TRUE ON 1ST PASS THRU BACK SOLUTION
      JPASS1 = .TRUE.
C
C***    ***PUT REMAINING RHS IN CONTIGUOUS LOCATIONS BY COLUMNS
C***   FROM KORE - (M * KF) + 1  TO  KORE
C
      NNEW = KORE - KF + 1
      MM1 = M - 1
```

```
C
C***    ***IF M = 1, THE ELTS OF THE 1 RHS COLUMN ARE ALREADY IN CONTIGUO
C***    ***LOCATIONS
C
        IF( M .EQ. 1 )GO TO 262
        DO 260 I = 1,MM1
        NOLD = KORE - (I*N) + 1
        DO 260 J = 1,KF
        NNEW = NNEW - 1
        NOLD = NOLD - 1
        A(NNEW) = A(NOLD)
  260   CONTINUE
C
C***    ***NOW NNEW = KORE - (M*KF) + 1
C***    ***NOW NOLD = KORE - (M - 1) * N + 1 - KF
C   ***    SKIP 1ST PART OF TRAPEZOIDAL MATRIX + READ LAST K ROWS
C*** ***ATTATCH RHS TO IT SO THAT EVERYTHING IS IN CONSECUTIVE ORDER
262     NREMAN = ND - K
        IF(NREMAN .EQ. 0)GO TO 280
        DO 270 I = 1,NREMAN
  270   READ(MT) IDUMMY
  280   NEND = 0
        KCNT = K
        NNEW = NNEW - 1
C***    ***NOTE THAT K = KF WHICH IS ALREADY KNOWN IN CORE
        DO 290 JCNT = 1,K
        NBEG = NEND + 1
        CALL  GETT(MT, 4, KCNT, A(NBEG), 1, AA2)
        KCNT = KCNT - 1
        NEND = NBEG + KCNT
        NNEW = NNEW + 1
        KEND = (MM1 * KF) + NNEW
        DO 290 NPP=NNEW,KEND,KF
        NEND = NEND + 1
  290   A(NEND) = A(NPP)
        REWIND LTAPE
        REWIND MT
C
C - - THERE, NOW WE CAN START THE BACK-SOLUTION
C * * NOTE..THE FIRST AVAILABLE LOCATION FOR THE SOLUTIONS IS A(NL)
C
C
C***    ***NL IS THE LAST SUBSCRIPT + 1 OF THE TRAPEZOIDAL A MATRIX THAT
C***    ***CORE
C
        NL = NEND + 1
        NREM = N
        NPM = N + M
        NEL = NPM
        MP1 = M + 1
        LAST = K .EQ. N
        NPASS = 0
C
C - - SOLVE FOR THE ANSWERS CORRESPONDING TO 'K' ROWS
C
  300   KM1 = K - 1
        KP1 = K + 1
```

```
      NS = NL - MP1                                                     QUAS342
      NPASS = NPASS + 1                                                 QUAS343
      DO 330 MN = 1, M                                                  QUAS344
      NF = NS + MN                                                      QUAS345
      A(NF) = A(NF) / A(NS)                                             QUAS346
      NT = NS                                                           QUAS347
      IF (KM1 .EQ. 0) GO  TO 330                                        QUAS348
      DO 320 IB = 1, KM1                                                QUAS349
      NF = NF - IB - M                                                  QUAS350
      NT = NT - MP1 - IB                                                QUAS351
      SUM = 0.0                                                         QUAS352
      NP = NF                                                           QUAS353
      N2 = MP1 + IB                                                     QUAS354
      DO 310 IO = 1, IB                                                 QUAS355
      NN = NT + IO                                                      QUAS356
      NP = NP + N2 - IO                                                 QUAS357
  310 SUM = SUM + A(NN) * A(NP)                                         QUAS358
  320 A(NF) = (A(NF) - SUM) / A(NT)                                     QUAS359
  330 CONTINUE                                                          QUAS360
C                                                                       QUAS361
C - - MOVE THE SOLUTIONS TO CONTIGUOUS LOCATIONS STARTING AT A(N1)      QUAS362
C                                                                       QUAS363
      N1 = KORE + 1                                                     QUAS364
      DO 350 NN = 1, K                                                  QUAS365
      DO 340 MN = 1, M                                                  QUAS366
      NL = NL - 1                                                       QUAS367
      N1 = N1 - 1                                                       QUAS368
  340 A(N1) = A(NL)                                                     QUAS369
  350 NL = NL - NN                                                      QUAS370
C                                                                       QUAS371
C - - WRITE THE SOLUTIONS ON TAPE                                       QUAS372
C                                                                       QUAS373
      WRITE (NIN) K                                                     QUAS374
      NS = N1 - 1                                                       QUAS375
      DO 360 MN = 1, M                                                  QUAS376
      NT = NS + MN                                                      QUAS377
  360 WRITE (NIN ) (A(IO), IO = NT, KORE, M)                            QUAS378
C                                                                       QUAS379
C - - TEST IF THIS IS THE LAST PASS                                     QUAS380
C                                                                       QUAS381
      IF (LAST) GO TO 470                                               QUAS382
C                                                                       QUAS383
C - - WE MUST NOW MODIFY THE TRIANGULAR MATRIX TO REFLECT THE EFFECT OF QUAS384
C     THE SOLUTIONS OBTAINED SO FAR  (EQ 21)                            QUAS385
C * * NOTE..LOCATIONS A(1) TO A(N1-1) ARE NOW FREE TO USE               QUAS386
C                                                                       QUAS387
C - - CALCULATE THE NEXT VALUES OF 'NEL' AND 'NREM'                     QUAS388
C                                                                       QUAS389
      NELOLD = NEL                                                      QUAS390
      KOLD = K                                                          QUAS391
      NEL = NEL - K                                                     QUAS392
      NREM = NREM - K                                                   QUAS393
C                                                                       QUAS394
      NROW = NREM - K + 1                                               QUAS395
      IF (K .LT. NREM) GO TO 370                                        QUAS396
      LAST = .TRUE.                                                     QUAS397
      NROW = 1                                                          QUAS398
```

```
      K = NREM
  370 NS = 1
      NT = NELOLD + 1
C
C - - READ IN THE ROWS TO BE MODIFIED
C
      DO 450 IB = 1, NREM
      NT = NT - 1
      IF (IB .LE. NROW) GO TO 380
      NS = NS + NN
      NT = NT + NN
  380 IF (.NOT. JPASS1)GO TO 390
      NBEG = NT - M + 1
C*** ***READ RHS FROM NATAPE
      CALL  GETT(NATAPE, 1, M, A(NBEG), 1, AA2)
      NT = NT - M
  390 CALL  GETT(MT, 2, NN, A(NS), 1, AA2)
      IF( .NOT. JPASS1 ) GO TO 400
      NT = NT + M
      NN = NN + M
  400 NP = N1 - 1
      NF = NT - M - KM1
      NN = NN - KOLD
      DO 420 MN = 1, M
      N2 = NF
      NA = NP + MN
      NE = NA
      SUM = 0.0
      DO 410 IO = 1, KOLD
      SUM = SUM + A(N2) * A(NA)
      N2 = N2 + 1
  410 NA = NA + M
      N2 = N2 + MN - 1
  420 A(N2) = A(N2) - SUM
C
C - - WRITE THE MODIFIED ROW ON TAPE OR CONDENSE THE ROW
C
      NL = NT - M + 1
      IF (IB .GE. NROW) GO TO 430
      NF = NL - KP1
      NN1 = NF - NS + 1
      NN2 = NT - NL + 1
      CALL  SAVE(NOUT, 4, NN, NN1,      A(NS), NN2, A(NL))
      GO TO 450
  430 NF = NL - KOLD
      DO 440 MN = NL, NT
      A(NF) = A(MN)
  440 NF = NF + 1
  450 CONTINUE
C*** ***IF 1ST TIME THRU BACK SOLN,SWITCH TAPES SO THAT MT WHICH HAS THE
C*** ***ORIGINAL TRAPEZOIDAL MATRIX ON IT BECOME NATAPE AND IS NOT TO
C*** ***TAPE PART IN ALTERNATING SHRINKING MATRICES.  NATAPE BECOMES MT
C*** ***AND THIS NOW DOES THE ALTERNATING WITH NOUT.
      IF( .NOT. JPASS1 ) GO TO 460
      NTEMP = MT
      MT = NATAPE
      NATAPE = NTEMP
```

```
      JPASS1= .FALSE.
      REWIND NATAPE
  460 REWIND MT
      REWIND NOUT
C
C - - SWITCH THE TAPES
C
      NT = MT
      MT = NOUT
      NOUT = NT
C
C - - LOOP BACK THRU THE SOLUTION
C
      NL = NF
      GO TO 300
C
C - - START TO WRAP IT UP
C
  475 REWIND NIN
      N2 = N
C
C * * NOTE.. AT THIS POINT ALL LOCATIONS A(1) THRU A(KORE) ARE FREE
C
      DO 490 IB = 1, NPASS
      READ (NIN) K
      N1 = N2 - K + 1
      NS = N1
      NT = N2
C
C - - READ IN THE SOLUTIONS
C
      DO 480 IO = 1, M
      CALL  GETT(NIN, 1, K, A(NS), 1, AA2)
      NT = NT + N
  480 NS = NS + N
  490 N2 = N1 - 1
C
C  ---  REWIND ALL INPUT TAPES
      REWIND NIN
      REWIND MT
      REWIND NOUT
C - - WRITE THE SOLUTIONS ON TAPE
C
      NT = 0
      DO 500 IO = 1, M
      NS = NT + 1
      NT = NT + N
  500 CALL  SAVE(NW, 1, N, N, A(NS), 1, AA2)
C   ***   IF TAPE WAS NEVER SWITCHED IT WOULD BE FOOLISH TO SWITCH BACK
      IF(JPASS1)GO TO 510
C
C***   ***SWITCH TAPES
C*** ***BACK SO THAT  MT WILL CONAIN THE TRAPEZOIDAL MATRIX
C*** ***NATAPE WILL HAVE NOTHING USEFUL ON IT.
      NTEMP = NATAPE
      NATAPE = MT
      MT = NTEMP
```

```
      REWIND NATAPE
  510 IF( .NOT. LASTRS)GO TO 150
  520 REWIND LTAPE
      REWIND MT
      KRED = 0
      DO 540 I=1,NLCNT
      READ(LTAPE)KREAD
  530 CONTINUE
      KRED = KRED + KREAD
      KPEAD = KREAD + ( N - KRED - 1)
      DO 540 LREAD=1,KREAD
  540 READ(LTAPE)
      DO 550 NROW = 1,ND
      CALL  GETT(MT, 2, ICNT, A(1), 1, AA2)
  550 CALL  SAVE(LTAPE, 2, ICNT, ICNT, A, 1, AA2)
C
C   ***   REWIND ALL FILES EXCEPT THE OUTPUT FILE   NW
      REWIND LTAPE
      REWIND  NI
      REWIND  MH
      REWIND  NO
      REWIND  NAT
      IF( RHSTAP .NE. 0 ) REWIND RHSTAP
      CALL TIMEV(AA2)
      MD = MTOTAL
      RB = (AA2 - AA1) / 60.
      WRITE(6,560)N,N,MTOTAL,RB
  560 FORMAT (4H0THE I5, 2H X I5, 12H MATRIX WITH I4, 35H RIGHT SIDES WA
     1S SOLVED DIRECTLY IN F8.3, 9H MINUTES. )
  570 CONTINUE
      RFTURN
      END
```

```
      SUBROUTINE TSETV
      RETURN
      END
```

```
      FUNCTION ARSIN(X)
      ARSIN=ASIN(X)
      RETURN
      END
```

```
      SUBROUTINE  COMBO(N, LT, MT, NONU)
C
C
C   CALCULATE COMBINATION CONSTANTS CCK, SYSTEM ANGLE OF ATTACK
C   AND CL, SYSTEM LIFT CURVE CONSTANTS (K1, K2, + K3), AND CK CONSTANTS.
C
C      N = TOTAL NUMBER OF ELEMENTS
C     LT = NUMBER OF LIFTING BODIES
C     MT = NUMBER OF ONSET FLOWS
C    MT1 = MT + 1
C    CCL = CHORD FOR CLT CALCULATION
C    INCLT FLAG,  = 0, ALPHA INPUT (COMES IN AS CLT)
C             NOT = 0, CLT INPUT
C
C
      DIMENSION  BLU(500), DV(10,12), A(10,10), CCK(10,12), SIG(500)
C
C
      COMMON /FILEID/ IF01, IF02, IF03, IF04, IF05, IF06, IF07, IF08,
     1                IF09, IF10, IF11, IF12, IF13, IF14, IF15
     2               ,IFIL16, IFIL17, IFIL18, IFIL19, IFIL20
C
C
      COMMON /COMBOD/CCL, INCLT, CLT, ALPHA, SUMDS(10), TLU(10,12),IND
     1              , ALPHAO, CNU(10), SMDSWF(10), MTO(10)
      COMMON /SIGMAS/CSIG(500), CK(12)
      EQUIVALENCE (BLU(1), CSIG(1))
C
      DATA PI, RC/3.1415927, 1.7453293E-2/
      MRHS = 2
      IF (NONU .GT. 0)  MRHS = 3
C
      PIC = 0.0
      RK1 = 0.0
      RK2 = 0.0
      RK3 = 0.0
      ALPHAO = 0.0
      IF (LT .EQ. 0)  GO TO 140
C
C
C  CALCULATE TRAILING EDGE VELOCITY DIFFERENCE ARRAY
C
C  INITIALIZE DV ARRAY TO TLU VALUES
      DO 5 L = 1,LT
      DO 5 K = 1,MT
    5 DV(L,K) = TLU(L,K)
C
      REWIND IF13
      DO 30 L = 1,LT
      CALL GETT (IF13, I, N, BLU, 1, 0)
      REWIND IF14
      DO 20 K = 1,MT
      CALL GETT (IF14, I, N, SIG, 1, 0)
      DO 10 J = 1,N
   10 DV(L,K) = DV(L,K) + BLU(J)*SIG(J)
   20 CONTINUE
   30 CONTINUE
C
C
```

```
C   SET ARRAYS TO OBTAIN COMBINATION CONSTANTS CCK. USE MIS1
C       A(LT,LT) IS COEF. ARRAY
C       CCK(LT,3) IS INPUT AS RHS, RETURNED AS CCK.
C
      DO 70 L = 1,LT
      CCK(L,1) = -DV(L,1)
      CCK(L,2) = -DV(L,2)
      CCK(L,3) = 0.0
      IF (NONU .LE.0)  GO TO 50
      M = LT + 2
      DO 40 K = 1,NONU
      M = M + 1
   40 CCK(L,3) = CCK(L,3) - DV(L,M)*CNU(K)
   50 CONTINUE
C
      DO 60 K = 1,LT
      K2 = K + 2
   60 A(L,K) = DV(L,K2)
C
   70 CONTINUE
C
      IF (LT .GT. 1)  GO TO 90
C
C ONLY ONE LIFTING BODY.  CALCULATE COMBINATION
C CONSTANTS STRAIGHT AWAY.
      DO 80 K = 1,MRHS
   80 CCK(1,K) = CCK(1,K)/A(1,1)
      GO TO 110
C
C  CALL MIS1 FOR SOLUTION
   90 CONTINUE
      D = 1.0
      LIC = 10
      CALL MIS1 (A, LT,LIC, CCK, MRHS, NERR, D)
C
C  CHECK FOR SINGULAR CASE
      WRITE (6,100)  NERR
  100 FORMAT(1H0, 'ON RETURN FROM MIS1, NERR = ', I2)
C
C  CALCULATE SYSTEM ANGLE OF ATTACK (ALPHA) AND TOTAL LIFT (CLT).
C
  110 CONTINUE
      DO 130 L = 1,LT
      RK1 = RK1 + SMDSWF(L) * CCK(L,1)
      RK2 = RK2 + SMDSWF(L) * CCK(L,2)
  120 RK3 = RK3 + SMDSWF(L) * CCK(L,3)
C
  130 CONTINUE
C
      PIC = 8.*PI/CCL
      ALPHAO  = ATAN2(RK1, RK2)
C
C  CHECK IF ALPHA OR CLT INPUT
      IF (INCLT .EQ. 0)  GO TO 140
C
C  CLT INPUT,  DETERMINE ALPHA
      RK4 = (CLT/PIC - RK3)/SQRT(RK1**2 + RK2**2)
```

```
      ALPHA = -ALPHAO + ARSIN(RK4)
      GO TO 150
C
C  ALPHA INPUT, CALCULATE CLT (REPEATED IF INPUT)
  140 ALPHA = ALPHA*RC
  150 COSA = COS(ALPHA)
      SINA = SIN(ALPHA)
      IF (INCLT .EQ. 0)
     1CLT = PIC*(RK1*COSA + RK2*SINA + RK3)
      ALPHA = ALPHA/RC
      ALPHAO = ALPHAO/RC
C
C  CALCULATE COEFFICIENTS  CK(K) FOR LIFTING BODIES
      CK(1) = COSA
      CK(2) = SINA
C
      IF (LT .LE. 0)  GO TO 165
      DO 160 L = 1,LT
      K = L + 2
      CK(K) = CCK(L,1)*COSA + CCK(L,2)*SINA + CCK(L,3)
  160 [illegible]
C
C  SET NON-U FLOW CK'S TO ASSUMED VALUE OF 1.0
  165 CONTINUE
      IF (NONU .LE. 0)  GO TO 180
      K = LT + 2
      DO 170 J = 1,NONU
      K = K + 1
  170 CK(K) = CNU(J)
  180 CONTINUE
C
C  CALCULATE  COMBINED SIGMAS
      DO 190 J = 1,N
  190 CSIG(J) = 0.0
      REWIND IF14
      DO 210 K = 1,MT
      CALL GETT (IF14, 1, N, SIG, 1, 0)
      DO 200 J = 1,N
  200 CSIG(J) = CSIG(J) + SIG(J)*CK(K)
  210 CONTINUE
C
C
C  PRINT OUT SOME STUFF FOR CHECKOUT PURPOSES
      WRITE (6,220)  ALPHA
  220 FORMAT (1H1, 'COMBINATION CONSTANTS'//T10,'ALPHA  = ',
     1           T30,'0', T50,'90', T64, F12.6)
C
      IF (LT .LE. 0)  GO TO 245
      DO 230 L = 1, LT
      K = L + 2
  230 WRITE (6,240)  L, CCK(L,1), CCK(L,2), CK(K)
  240 FORMAT (1H0, T14,I2, T24,F12.6, T44,F12.6, T64,F12.6)
C
  245 CONTINUE
      WRITE (6,250) RK1, RK2, RK3, ALPHAO, ALPHA, CLT
  250 FORMAT (1H0, ///' LIFT CURVE CONSTANTS'//T10,'RK1 = ',F12.6,
     1           T30,'RK2 = ',F12.6, T50,'RK3 = ',F12.6//T10,
```

```
     2        'ALPHAO = ', F12.6//T10,'ALPHA  = ',F12.6//T10,          COMB174
     3        'CLT    = ', F12.6)                                      COMB175
C                                                                      COMB176
C                                                                      COMB177
C                                                                      COMB178
      RETURN                                                           COMB179
      END                                                              COMB180
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
      SUBROUTINE  OFFPTS(NO, X, Y, TITLE, LAST, CHORDB, IDB, IBTOT)
C
      DIMENSION X(1), Y(1), TITLE( 7)
     1          ,CHORDB(10), IDB(10)
C
C
      DATA EPS/1.0E-7/
C
      DR=3.14159265/180.
C  READ IN BODY TITLE AND CONTROL CARD
   10 ITYP = 21
      READ(5,20) ID, TITLE, ITR, INORM, IDOLD, LAST, ITYPE
   20 FORMAT( I1, 9X7A4, 12X, 2(2XI1), 2(5XI1), 2X I2)
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)
C
C  READ IN COORDINATE TRANSFORMATION CARD IF REQUIRED
```

```
      ITYP = 22
      CHORD = 0.0
      IF (ITR .EQ. 0 .OR. ITR .EQ. 2)  GO TO 40
      READ (5,30) CHORD, XMULT, YMULT, DX, DY, THETA, XTO, YTO, ITYPE
   30 FORMAT (7(F8.0,1X), F8.0, I1)
      IF (ITYPE .NE. (ITYP-20))  CALL TYPE(ITYP, ITYPE)
C
   40 CONTINUE
C
C  CHECK IF ELLIPSE TO BE GENERATED
      IF (ITR .GT. 1)  GO TO 90
C
C  DATA ON UNIT 5.  X-COORDS FIRST
      L = 0
      ITYP = 23
   50 READ (5,60)  (X(L+I), I=1,6), INO, ISTAT, ITYPE
   60 FORMAT (6F10.0, 4XI1, 2XI1, 3XI1)
      IF (ITYPE .NE. (ITYP-20))  CALL TYPE(ITYP, ITYPE)
      IF (INO .LE. 0  .OR.  INO .GT. 6) INO = 6
      L = L + INO
      IF (ISTAT .EQ. 0) GO TO 50
      LX = L
C
C  NOW READ IN Y-COORDS
      L = 0
      ITYP = 24
   70 READ (5,60)  (Y(L+I), I=1,6), INO, ISTAT, ITYPE
      IF (ITYPE .NE. (ITYP-20))  CALL TYPE(ITYP, ITYPE)
      IF (INO .LE. 0  .OR.  INO .GT. 6) INO = 6
      L = L + INO
      IF (ISTAT .EQ. 0) GO TO 70
      LY = L
C
C  CHECK FOR INPUT CONSISTENCY
      IF (LY .EQ. LX) GO TO 120
      WRITE (6,80) LY, LX
   80 FORMAT (1H1,'THE NUMBER OF Y-COORDINATES (',I3,') READ DOES ',
     1           'NOT EQUAL THE NUMBER OF X-COORDINATES READ (',I3,')')
      GO TO 200
C
C  ELLIPSE TO BE GENERATED.  READ IN DEFINITION CARD.
   90 ITYP = 25
      READ (5,100) LX, ELPSTH, ITYPE
  100 FORMAT (2XI3, 5XF10.5, 51XI1)
      IF (ITYPE .NE. (ITYP-20))  CALL TYPE(ITYP, ITYPE)
      ITR = ITR - 2
      IF (ITR .NE. 1)  ITR = 0
C
      DANGLE = 6.2831853072/(LX - 1)
      ANGLE = DANGLE
      DO 110 I = 1,LX
      ANGLE = ANGLE - DANGLE
      X(I) = COS(ANGLE)
  110 Y(I) = SIN(ANGLE)*ELPSTH
C
  120 CONTINUE
C
```

```
C  WRITE OUT BASIC GEOMETRY DATA
      IP = 1
C
C
C  TRANSFORM COORDINATES IF REQUESTED
      IF (ITR .EQ. 1) GO TO 130
      IF (INORM .EQ. 0)  GO TO 220
      XMULT = 0.0
      YMULT = 0.0
      XTO = 0.0
      YTO = 0.0
      THETA = 0.0
      DX = 0.0
      DY = 0.0
  130 CONTINUE
C
      IF (ABS(XMULT) .LT. EPS)      XMULT = 1.0
      IF (ABS(YMULT) .LT. EPS)      YMULT = 1.0
      XSF = XMULT
      YSF = YMULT
      IF (INORM .EQ. 0)  GO TO 180
C
      IF (IDOLD .LE. 0)  GO TO 160
      DO 140  IB = 1,IBTOT
      IF (IDB(IB) .EQ. IDOLD)  GO TO 150
  140 CONTINUE
      GO TO 160
  150 CHORD = CHORDB(IB)
  160 IF (ABS(CHORD) .LE. EPS)  GO TO 180
  170 XSF = XSF/CHORD
      YSF = YSF/CHORD
C
  180 COST = COS(THETA*DR)
      SINT = SIN(THETA*DR)
      DO 190 I = 1,LX
      XTOD = X(I) - XTO
      YTOD = Y(I) - YTO
      X(I) = (XTO + XTOD*COST - YTOD*SINT + DX)*XSF
      Y(I) = (YTO + YTOD*SINT + YTOD*COST + DY)*YSF
  190 CONTINUE
      GO TO 220
C
  200 WRITE (6,210)
  210 FORMAT (1H0, 'BECAUSE OF THE ABOVE ERROR, THIS RUN IS TERMINATED')
      STOP
C
C
  220 CONTINUE
      NO = LX
      RETURN
      END
```

```
      SUBROUTINE  SOLVE(N, M, ISIZE, ISOL)
C
C
C  THIS ROUTINE OBTAINS THE SIGMA SOLUTIONS
C  FROM EITHER SOLVIT (ISOL=0), QUASI (ISOL=1), OR MIS1 (ISOL=2)
C
C
      COMMON /SPACER/ WKAREA(11413)
C
      DIMENSION  A(101,101), SIG(101,12)
C
      EQUIVALENCE  (A(1,1),WKAREA(1)), (SIG(1,1), WKAREA(10202))
C
      COMMON /FILEID/ IFILE1, IFILE2, IFILE3, IFILE4, IFILE5,
     1                IFILE6, IFILE7, IFILE8, IFILE9, IFIL10,
     2                IFIL11, IFIL12, IFIL13, IFIL14, IFIL15
     3               ,IFIL16, IFIL17, IFIL18, IFIL19, IFIL20
C
C
      IF (ISOL .EQ. 2)  GO TO 70
      MM = M
      CALL TIMEV(T)
   10 IF (ISOL .NE. 0)  GO TO 30
C
   15 CONTINUE
C
      WRITE(6,20) T
   20 FORMAT(1H0, 'SOLVIT TIME = ', F9.3, ' SECONDS.')
C
      CALL SOLVIT (WKAREA, N, MM, ISIZE, IFILE9, IFILE1,
     1             IFILE2, IFIL14, +50)
      CALL TIMEV(T)
      WRITE(6,20) T
      RETURN
C
C
   30 WRITE(6,40) T
      CALL  QUASI(WKAREA, N,MM, ISIZE, IFILE9, IFILE1, IFILE2,
     1             IFILE3, IFIL14, IFIL15, IFILE4,+50)
      CALL TIMEV(T)
      WRITE(6,40) T
   40 FORMAT(1H0, 'QUASI TIME = ', F9.3,'SECONDS.')
      RETURN
C
C
C
C
C  USE MIS1 (MIS2)
C
C  A-ARRAY STORED ON IFIL10
C
C  RHS STORED ON IFILE4
C
C  SIGMAS SAVED ON IF14
C
```

```
C
   70 NMAX = 101
      IF14=  IFIL14
      REWIND IFIL10
      REWIND IFILE4
      REWIND IF14
      IF (N .LE. NMAX)  GO TO 90
      WRITE(6,80)  N, NMAX
   80 FORMAT(1H0,'THE SIZE OF ARRAY (',I5,') EXCEEDS LIMIT OF ', I4)
      GO TO 15
C
   90 CONTINUE
C
      D = 1.0
C
C  READ IN A-ARRAY
      DO 100 I = 1,N
      READ(IFIL10)  (A(I,J),J=1,N)
  100 READ (IFIL10)
C
C  READ IN RHS IN SIG ARRAY
      READ(IFILE4) MDUM
      DO 110 K = 1,M
  110 READ(IFILE4)  (SIG(I,K),I=1,N)
C
C
      CALL MIS2(A, N, NMAX, SIG, M, NERR, D)
C
      WRITE (6,120)  NERR
  120 FORMAT(1H0,'ON RETURN FROM MIS2, NERR = ', I2)
C
C  SAVE SIGMAS
      DO 130 J = 1,M
  130 WRITE(IF14)  (SIG(I,J), I=1,N)
      RETURN
C
C
      END
```

```
      SUBROUTINE  VXYOFF(N, M, NO, X, Y)
C
      DIMENSION  SIG(500), X(1), Y(1), A(500), P(500)
     1          ,VX(12), VY(12), VXI(12), VYN(12)
C
      COMMON/ELD/    XO(500), YO(500), DS(500), SA(500), CA(500),
     1          CURV(500), DL(500)
C
      COMMON/COMBOD/CCL,INCLT,CLT,ALPHA,SUMDS(10),TLU(10,12),IND
     1             , ALPHAO, CNU(10), SMDSWF(10), PIO(10)
      COMMON /SIGMAS/ CSIG(500), CK(12)
      COMMON /GCF/ WF(500)
C
      COMMON/BFLAG/ IDB(10), INL(10), IFL(10), NL(10), LIFT(10),
     1              IBMF(10), ISAV1(10), ISAV2(10), ISAV3(10),
     2              BTITLE(10,  7), IBT, IBST, IBTOT, NELTOT,
     3              ITRB(10), INMB(10), CHORD(10), IBD(10), LIFTOT
     4             ,IPRB(10), IFST(10), ISEC(10), FTITLE(15), IPVR(10)
C
C
C
      COMMON /FILEID/  IFA1, IFA2, IF03, IF04, IF05,
     1                 IF06, IF07, IF08, IF09, IF10,
     2                 IF01, IF02, IF13, IF14, IF15
     3                ,IF16, IF17, IF18, IF19, IF20
      REWIND  IF01
      REWIND  IF02
C
C
C  SET SOME QUANTITIES
   20 SAI = 0.0
      CAI = 1.0
      DSI = 0.0
C
      DO 230 I = 1,NO
      JJ = 0
      K = 2
C
      DO 150 IB = 1,IBTOT
      IF (IBMF(IB) .LT. 0)  GO TO 150
C
C  COUNTER FOR ELEMENT GEOMETRY
      J = INL(IB) - 1
C  COUNTERS FOR A,B ARRAYS
      JI = JJ + 1
      JF = JJ + NL(IB)
C
C  JJ IS COUNTER FOR THE CURRENT ELEMENT
C
C  ZERO OUT A&B ARRAYS
      DO 30 JJ1 = JI,JF
      A(JJ1) = 0.0
   30 B(JJ1) = 0.0
C
      JJ = JI
      JJ1 = JJ + 1
```

```
      JJ3 = JJ1 + 1                                                     VXY0057
      GO TO 50                                                          VXY0058
   40 JJ3 = JJ + 1                                                      VXY0059
   50 J = J + 1                                                         VXY0060
      A0     =            XYFORM( X(I), Y(I),  DSI,  SAI,  CAI,
     1                           X0(J),Y0(J),DL(J),SA(J),CA(J),B0)
      B(JJ ) = B(JJ ) + B0                                              VXY0064
      A(JJ) = A(JJ) + A0                                                VXY0065
C                                                                       VXY0066
C                                                                       VXY0067
C                                                                       VXY0095
C                                                                       VXY0070
C                                                                       VXY0078
C                                                                       VXY0080
C                                                                       VXY0084
C                                                                       VXY0087
C                                                                       VXY0097
C                                                                       VXY0101
  110 JJ1 = JJ                                                          VXY0102
      JJ = JJ + 1                                                       VXY0103
      IF (JJ - JF)140,120,130                                           VXY0104
C                                                                       VXY0105
  120 JJ3 = JJ1 - 1                                                     VXY0106
      GO TO 50                                                          VXY0107
  130 JJ = JJ - 1                                                       VXY0108
C                                                                       VXY0109
C                                                                       VXY0110
      IF (LIFT(IB) .EQ. 0)  GO TO 150                                   VXY0111
      VN = 0.0                                                          VXY0112
      VT = 0.0                                                          VXY0113
      DO 140 J = JI,JF                                                  VXY0114
      VN = VN-  B(J)*WF(J)                                              VXY0115
  140 VT = VT + A(J)*WF(J)                                              VXY0116
C                                                                       VXY0117
      K = K + 1                                                         VXY0118
      VXT(K)= VT                                                        VXY0119
      VYN(K)= VN                                                        VXY0120
  150 CONTINUE                                                          VXY0121
C                                                                       VXY0122
C  SET UNIFORM ONSET FLOWS                                              VXY0123
C  ALPHA = 0                                                            VXY0124
      VXT(1)= CAI                                                       VXY0125
      VYN(1)=-SAI                                                       VXY0126
C                                                                       VXY0127
C  ALPHA = 90                                                           VXY0128
      VXT(2)= SAI                                                       VXY0129
      VYN(2)= CAI                                                       VXY0130
C                                                                       VXY0131
C  SET INPUT NON-UNIFORM ONSET FLOWS                                    VXY0132
      M1 = LIFTOT + 2                                                   VXY0133
      IF (M .EQ. M1)  GO TO 170                                         VXY0134
      M2 = M1 + 1                                                       VXY0135
      DO 160 K = M2, M
      VXT(K) = 0.0                                                      VXY0137
  160 VYN(K) = 0.0                                                      VXY0138
  170 CONTINUE                                                          VXY0139
C                                                                       VXY0140
```

```
C  CHECK IF INDIVIDUAL FLOWS DESIRED
      IF (IND .NE. 1)  GO TO 200
      REWIND IF14
C
C  CALCULATE INDIVIDUAL FLOWS
      DO 190 K = 1,M
      CALL GETT(IF14, 1, N, SIG(1), 1, VN)
      VX(K) = VXT(K)
      VY(K) = VYN(K)
C
      DO 180 J = 1,N
      VX(K) = VX(K) + B(J)*SIG(J )
  180 VY(K) = VY(K) + A(J)*SIG(J )
  190 CONTINUE
C
C  SAVE VELOCITIES
      WRITE(IF02)  (VX(K), VY(K), K = 1,M)
C
C  CALCULATE COMBINED FLOW
  200 VXC = 0.0
      VYC = 0.0
      DO 210 K = 1,M
      VXC = VXC +VXT(K)*CK(K)
  210 VYC = VYC +VYN(K)*CK(K)
C
      DO 220 J = 1,N
      VXC = VXC + B(J)*CSIG(J)
  220 VYC = VYC + A(J)*CSIG(J)
C
C  SAVE VELOCITIES
      WRITE(IF01)  VXC, VYC
C
C
  230 CONTINUE
C
C
      RETURN
      END
```

```
      SUBROUTINE PLOXIS(XX,YY,EXEP,ORD,OFSETA,OFSET,SLETRS,SNOSZ,K5,K6,K
     1,L,NK,NL)
C
C***********************************************************************
C******   SUBROUTINE ADDED TO DRAW AND LABEL AXIS FRAMES FOR ALL PLOTS *
      COMMON/TITL/ TTITL(9,6)
      UP =11.-YY-2.*SNOSZ
      M1=XX
      M2=YY
      CALL PLOT(4.,-11.,-3)
      CALL PLOT(0.,UP,-3)
      DO 25 I=1,M1
      X=I
      P=EXEP*X +OFSETA
      CALL PLOT(X,0.,2)
      CALL PLOT(X, .2,2)
      M=I/2
      B=FLOAT(I)-FLOAT(M)-X/2.
      IF (B) 10,10,25
   10 IF (K5) 15,15,20
   15 CALL NUMBER(X-SNOSZ,-SNOSZ-.10,SNOSZ,P,0.,NK)
      GO TO 25
   20 SN = 1.333*SNOSZ
```

```
      CALL NUMBER(X-SNOSZ-SNOSZ,-SN-SNOSZ-.10,SN,10.,0.,-1)            U  0230
      CALL NUMBER(999.0,-SNOSZ -.10,SNOSZ,P,0.,NK)                      U  0240
   25 CALL PLOT(X,0.,3)                                                 U  0250
      B = (XX-54.*SLETRS)/2.                                            U  0260
      CALL SYMBOL(B,-SNOSZ-SLETRS-.15-.6,SLETRS,TTITL(1,K),0.,54)       U  0270
      CALL PLOT(0.,0.,3)                                                U  0280
      DO 45 J=1,M2                                                      U  0290
      Y=J                                                               U  0300
      O=ORD*Y+OFSET                                                     U  0310
      CALL PLOT(0.,Y,2)                                                 U  0320
      CALL PLOT(.2,Y,2)                                                 U  0330
      N=J/2                                                             U  0340
      B=FLOAT(J)-FLOAT(N)-Y/2.                                          U  0350
      IF (B) 30,30,45                                                   U  0360
   30 IF (K6) 35,35,40                                                  U  0370
   35 CALL NUMBER(-4.*SNOSZ          -.15,Y,SNOSZ,O,0.,NL)              U  0380
      GO TO 45                                                          U  0390
   40 SN = 1.333*SNOSZ                                                  U  0400
      CALL NUMBER(-.15 -SN-SN-SN    ,Y-SNOSZ,SN,10.,0.,-1)              U  0410
      CALL NUMBER(999.0,Y+SN-SNOSZ,SNOSZ,O,0.,NL)                       U  0420
   45 CALL PLOT(0.,Y,3)                                                 U  0430
      C = (YY-54.*SLETRS)/2.                                            U  0440
      CALL SYMBOL(-SNOSZ-SNOSZ-SNOSZ-.15-.6,C,SLETRS,TTITL(1,L),90.,54) U  0450
      CALL PLOT(0.,YY,3)                                                U  0460
      CALL PLOT(XX,YY,2)                                                U  0470
      CALL PLOT(XX,0.,2)                                                U  0480
      DO 50 J=1,M2,2                                                    U  0490
      Y=J                                                               U  0500
      IF (Y.EQ.YY) GO TO 55                                             U  0510
      CALL PLOT(XX,Y,3)                                                 U  0520
      CALL PLOT(0.,Y,2)                                                 U  0530
      IF ((Y+1.).EQ.YY) GO TO 55                                        U  0540
      CALL PLOT(0.,Y+1.,3)                                              U  0550
   50 CALL PLOT(XX,Y+1.,2)                                              U  0560
   55 CONTINUE                                                          U  0570
      DO 60 J=1,M1,2                                                    U  0580
      X=J                                                               U  0590
      IF (X.EQ.XX) GO TO 65                                             U  0600
      CALL PLOT(XX-X,YY,3)                                              U  0610
      CALL PLOT(XX-X,0.,2)                                              U  0620
      IF ((XX-X-1.).EQ.0.) GO TO 65                                     U  0630
      CALL PLOT(XX-X-1.,0.,3)                                           U  0640
   60 CALL PLOT(XX-X-1.,YY,2)                                           U  0650
   65 RETURN                                                            U  0660
      END                                                               U  0670
```

```
      SUBROUTINE ARROW(VX,VY,X,Y,VPER)
      COMMON/PICTUR/BUNNHJ,XX,XMIN,EXEP,YY,YMIN,ORD
      DIMENSION PINFO(1),PLABEL(1)
      PIO180=3.14159265/180.
      SIZE=SQRT(VX*VX+VY*VY)/VPER
      IF(VX.EQ.0.)VX=1.E-9
      ANGLE=-SIGN(90.,VX)+ATAN(VY/VX)/PIO180
      XP=(X-XMIN)/EXEP
      YP=(Y-YMIN)/ORD
      IF(XP.GT.XX.OR.XP.LT.0..OR.YP.GT.YY.OR.YP.LT.0.)RETURN
      SIZ=AMIN1(4./21.*SIZE,.15)
      SIZ2=SIZE-.5*SIZ
      XHEAD=XP+VX/VPER/SIZE*SIZ2
      YHEAD=YP+VY/VPER/SIZE*SIZ2
      CALL SYMBOL(XP,YP,SIZ2,16,ANGLE,-1)
      CALL SYMBOL(XHEAD,YHEAD,SIZ,2,ANGLE,-1)
      RETURN
      ENTRY NOTES(PINFO,PLABEL,N)
      DO 10 I=1,N
      YPO=(FLOAT(N)-FLOAT(I))*.3
      CALL SYMBOL(XX+.1,YPO,.2,PLABEL(I),0.,6)
10    CALL NUMBER(XX+1.2,YPO, .2,PINFO(I),0.,2)
      RETURN
      END
```

```
      SUBROUTINE  VPROFF(N, M, NO, X, Y, TITLE, IND)
C
      COMMON/PICTUR/VPERIN,XX,XMIN,EXEP,YY,YMIN,ORG
      COMMON /FILEID/  IFA1, IFA2, IFO3, IFO4, IFO5,
     1                 IFO6, IFO7, IFO8, IFO9, IF10,
     2                 IFO1, IFO2, IF13, IF14, IF15
     3                ,IF16, IF17, IF18, IF19, IF20
      DIMENSION X(1), Y(1), TITLE(7), V(1200),V1X(200),V2X(200),
     1              V3X(200),V4X(200),V5X(200),V1Y(200),V2Y(200),
     2              V3Y(200),V4Y(200),V5Y(200)
C
      DATA RD/57.2957797/
C
C   VX AND VY HAVE BEEN SAVED ON UNIT IFO2
      REWIND  IFO1
      REWIND  IFO2
C
      IF (IND .NE. 1)  GO TO 40
C
C   INDIVIDUAL FLOWS
      M2 = M + M
      I1 = 1 - M2
      I2 = 0
      DO 10 J = 1,NO
      I1 = I1 + M2
      I2 = I2 + M2
C
   10 READ(IFO2)  (V(K), K = I1,I2)
C
      DO 30 K = 1,M
      WRITE(6,60)  K, TITLE
C
      DO 20 I = 1,NO
      IX = (I-1)*M2 + 2*K - 1
      IY = IX + 1
      VT = SQRT(V(IX)**2 + V(IY)**2)
      TH = ATAN2(V(IY), V(IX))*RD
      IF(K.EQ.1) V1X(I) = V(IX)
      IF(K.EQ.1) V1Y(I) = V(IY)
      IF(K.EQ.2) V2X(I) = V(IX)
      IF(K.EQ.2) V2Y(I) = V(IY)
      IF(K.EQ.3) V3X(I) = V(IX)
      IF(K.EQ.3) V3Y(I) = V(IY)
      IF(K.EQ.4) V4X(I) = V(IX)
      IF(K.EQ.4) V4Y(I) = V(IY)
      IF(K.EQ.5) V5X(I) = V(IX)
      IF(K.EQ.5) V5Y(I) = V(IY)
C
   20 WRITE(6,70)  I, X(I), Y(I), V(IX), V(IY), VT, TH
C
   30 CONTINUE
        WRITE(7,1500) (X(J),J=1,NO)
        WRITE(7,1500) (Y(J),J=1,NO)
        WRITF(7,1500) (V1X(J),J=1,NO)
        WRITE(7,1500) (V2X(J),J=1,NO)
        WRITF(7,1500) (V3X(J),J=1,NO)
        WRITE(7,1500) (V4X(J),J=1,NO)
        WRITE(7,1500) (V5X(J),J=1,NO)
```

```
      WRITE(7,1500) (V1Y(J),J=1,NO)
      WRITE(7,1500) (V2Y(J),J=1,NO)
      WRITE(7,1500) (V3Y(J),J=1,NO)
      WRITE(7,1500) (V4Y(J),J=1,NO)
      WRITE(7,1500) (V5Y(J),J=1,NO)
 1500 FORMAT(0P6E13.8)
C                                                                    VPROC39
C                                                                    VPROC40
C  COMBINED FLOW                                                     VPROC41
  40 WRITE(6,80)  TITLE                                              VPROC42
C                                                                    VPROC43
      DO 50 I = 1,NO                                                 VPROC44
      READ(IFD1)  V(1), V(2)                                         VPROC45
      VT = SQRT(V(1)**2 + V(2)**2)                                   VPROC46
      IF(VPERIN.NE.0.)CALL ARROW(V(1),V(2),X(I),Y(I),2.)
      TH = ATAN2(V(2), V(1))*RD                                      VPROC47
  50 WRITE(6,70)  I, X(I), Y(I), V(1), V(2), VT, TH                  VPROC48
C                                                                    VPROC49
  60 FORMAT(1H1, 20X 'INDIVIDUAL FLOW NO. ',I2, 5X'OFFBODY POINTS',  VPROC50
    1        5X,7A4//T15,'I', T27,'X(I)', T44,'Y(I)', T61,'VX',      VPROC51
    2        T78,'VY', T95,'VT', T109,'THETA(DEG)'//)                VPROC52
  70 FORMAT(1H , 11XI3, 6(5XF12.6))                                  VPROC53
  80 FORMAT(1H1, 20X 'COMBINED FLOW FOR OFFBODY POINTS', 5X,7A4//    VPROC54
    1        T15,'I', T27,'X(I)', T44,'Y(I)', T61,'VX',              VPROC55
    2        T78,'VY', T95,'VT', T109,'THETA(DEG)'//)                VPROC56
C                                                                    VPROC57
      RETURN                                                         VPROC58
      END                                                            VPROC59
```

```
      SUBROUTINE DRAW(KR,KK )
C((((( SUBROUTINE ADDED TO DRAW PICTURE OF INLET VIA CALCOMP PLOTTER.
C
      DIMENSION X(400),Y(400)
      COMMON/PICTUR/VPERIN,XX,XMIN,EXEP,YY,YMIN,ORD
      COMMON /ELDATA/ XON(500),YON(500)
      KL=KR+1
      II=0
      DO 20 I=1,KL
      N=KK+I-1
      IF (II.GE.400.OR.N.GT.500) GO TO 30
C((((((    TEST EACH (X,Y) PT. EXCLUDE THOSE BEYOND (XX*EXEP+XMIN) INCHES
      YMAN=YY*ORD+YMIN
      IF(LPNCHO.EQ.2)  YON(N)=YMAN-( YON(N)-YMAN)
      IF (XON(N)-XX*EXEP-XMIN) 10,10,20
   10 IF (YON(N)-YY*ORD-YMIN) 15,15,20
   15 II=II+1
      X(II)=XON(N)
      Y(II)=YON(N)
   20 CONTINUE
   25 CALL LINE(X,Y,II,1,0,3,XMIN,EXEP,YMIN,ORD)
      RETURN
   30 WRITE (6,35)II,N
   35 FORMAT(1HO,' SCIRCLE ERROR EXIT - DATA POINTS EXCEED 200 ON A SEG
     1OR EXCEED 500 ON TOTAL INLET - ' /2I8)
      STOP
      END
```

```
      CALL NUMBER(X-SNOSZ-SNOSZ,-SN-SNOSZ-.10,SN,10.,0.,-1)
      CALL NUMBER(999.0,-SNOSZ -.10,SNOSZ,P,0.,NK)
   25 CALL PLOT(X,0.,3)
      B = (XX-54.*SLETRS)/2.
      CALL SYMBOL(B,-SNOSZ-SLETRS-.15-.6,SLETRS,TTITL(1,K),0.,54)
      CALL PLOT(0.,0.,3)
      DO 45 J=1,M2
      Y=J
      O=ORD*Y+OFSFT
      CALL PLOT(0.,Y,2)
      CALL PLOT(.2,Y,2)
      N=J/2
      B=FLOAT(J)-FLOAT(N)-Y/2.
      IF (B) 30,30,45
   30 IF (K6) 35,35,40
   35 CALL NUMBER(-4.*SNOSZ          -.15,Y,SNOSZ,O,0.,NL)
      GO TO 45
   40 SN = 1.333*SNOSZ
      CALL NUMBER(-.15 -SN-SN-SN    ,Y-SNOSZ,SN,10.,0.,-1)
      CALL NUMBER(999.0,Y+SN-SNOSZ,SNOSZ,O,0.,NL)
   45 CALL PLOT(0.,Y,3)
      C = (YY-54.*SLETRS)/2.
      CALL SYMBOL(-SNOSZ-SNOSZ-SNOSZ-.15-.6,C,SLETRS,TTITL(1,L),90.,54)
      CALL PLOT(0.,YY,3)
      CALL PLOT(XX,YY,2)
      CALL PLOT(XX,0.,2)
      DO 50 J=1,M2,2
      Y=J
      IF (Y.EQ.YY) GO TO 55
      CALL PLOT(XX,Y,3)
      CALL PLOT(0.,Y,2)
      IF ((Y+1.).EQ.YY) GO TO 55
      CALL PLOT(0.,Y+1.,3)
   50 CALL PLOT(XX,Y+1.,2)
   55 CONTINUE
      DO 60 J=1,M1,2
      X=J
      IF (X.EQ.XX) GO TO 65
      CALL PLOT(XX-X,YY,3)
      CALL PLOT(XX-X,0.,2)
      IF ((XX-X-1.).EQ.0.) GO TO 65
      CALL PLOT(XX-X-1.,0.,3)
   60 CALL PLOT(XX-X-1.,YY,2)
   65 RETURN
      END
```

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```
      SUBROUTINE  FLOWS (N, M, IPUN)
C
C  INDIVIDUAL FLOWS (IND = 1) AND COMBINED FLOWS CALCULATED.
C
C
      DIMENSION  A(500), B(500), VN(500), VT(500), VNC(500), VTC(500),
     1           SIG(500)
     2   , X(500), Y(500), DS(500), SA(500), CA(500)
      DIMENSION  ELGC(3500), ELGD(500), CPJ(500), XP(500), YP(500),
     1           V1(500),V2(500),V3(500),V4(500),V5(500)
C
      COMMON /BFLAG/ IDB(10), INL(10), IFL(10), NL(10), LIFT(10),
     1               IBMF(10), ISAV1(10), ISAV2(10), ISAV3(10),
     2               BTITLE(10,  7), IBT, IBST, IBTOT, NELTOT,
     3               ITRB(10), INMB(10), CHORD(10), IBD(10), LIFTOT,
     4               IPRB(10), IFST(10), ISEC(10), FTITLE(15), IPVR(10)
C
      COMMON /SIGMAS/ CSIG(500), CK(12)
      COMMON /FILEID/ IF01, IF02, IF03, IF04, IF05, IF06, IF07, IF08,
     1                IF09, IF10, IF11, IF12, IF13, IF14, IF15
     2               ,IF16, IF17, IF18, IF19, IF20
      COMMON /COMBOD/ CCL,INCLT,CLT,ALPHA,SUMDS(10),TLU(10,12), IND
     1               , ALPHAO, CNU(10), SMDSWF(10), MIO(10)
      COMMON/ROTAT/NROT, ROTRAD(10)
      COMMON /GCF/    WF(500)
      COMMON /ELD/    X, Y, DS, SA, CA, CURV(500), DL(500)
      EQUIVALENCE  (ELGC(1), X(1)),  (ELGD(1), WF(1))
      EQUIVALENCE  (A(1),XP(1)), (B(1),YP(1))
C
C  REWIND UNITS FOR NORMAL AND TANGENTIAL ONSET VELOCITIES
      REWIND IF11
      REWIND IF12
C
C  REWIND SIGMA UNIT
      REWIND IF14
C
C  ZERO OUT VNC AND VTC ARRAYS
      DO 10 I = 1,N
      VNC(I) = 0.0
   10 VTC(I) = 0.0
C
C
C  THE PROCEDURE IS TO FIRST CALCULATE THE INDIVIDUAL FLOWS
C  AND THEN THE COMBINED FLOW.  THE ONSET VELOCITIES ARE
C  COMBINED DURING THE INDIVIDUAL FLOWS CYCLE.
```

```
C                                                                       FLOWC45
C  READ IN SURFACE COORDS AND GEOMETRY COEFFICIENTS FROM UNIT 16        FLOWC46
      REWIND IF16                                                       FLOWC47
      READ(IF16) ELGC, ELGD                                             FLOWC48
C                                                                       FLOWC49
C                                                                       FLOWC50
C                                                                       FLOWC51
C  BEGIN INDIVIDUAL FLOWS CYCLE                                         FLOWC52
      VNA = 0.0                                                         FLOWC53
      DO 90 K = 1,M                                                     FLOWC54
C                                                                       FLOWC55
C  READ IN NORMAL AND TANGENTIAL ONSET VELOCITIES.                      FLOWC56
      CALL  GETT(IF11, 1, N, VN, 1, VNA)                                FLOWC57
      CALL  GETT(IF12, 1, N, VT, 1, VNA)                                FLOWC58
C                                                                       FLOWC59
C  CALCULATE COMBINED NORMAL + TANGENTIAL VELOCITIES                    FLOWC60
      DO 30 I = 1,N                                                     FLOWC61
      VNC(I) = VNC(I) - VN(I)*CK(K)                                     FLOWC62
   30 VTC(I) = VTC(I) + VT(I)*CK(K)                                     FLOWC63
C                                                                       FLOWC64
C  CHECK IF INDIVIDUAL FLOW DESIRED                                     FLOWC65
      IF (IND .NE. 1)  GO TO 90                                         FLOWC66
C                                                                       FLOWC67
C  REWIND A,B ARRAY UNITS                                               FLOWC68
      REWIND IF10                                                       FLOWC69
C                                                                       FLOWC70
C  READ IN ROW OF SIGMAS                                                FLOWC71
      CALL  GETT(IF14, 1, N, SIG,1, VNA)                                FLOWC72
C                                                                       FLOWC73
      DO 50 I = 1,N                                                     FLOWC74
C                                                                       FLOWC75
C  READ IN ROW OF A,B ARRAYS                                            FLOWC76
      CALL  GETT(IF10, 1, N, A,  1, VNA)                                FLOWC77
      CALL  GETT(IF10, 1, N, B,  1, VNA)                                FLOWC78
C                                                                       FLOWC79
      VN(I) = -VN(I)                                                    FLOWC80
      VNA = 0.0                                                         FLOWC81
      VTB = 0.0                                                         FLOWC82
      DO 40 J = 1,N                                                     FLOWC83
      VNA = VNA + A(J)*SIG(J)                                           FLOWC84
   40 VTB = VTB + B(J)*SIG(J)                                           FLOWC85
C                                                                       FLOWC86
      VN(I) = VN(I) + VNA                                               FLOWC87
   50 VT(I) = VT(I) + VTB                                               FLOWC88
C                                                                       FLOWC89
C                                                                       FLOWC90
C  PRINT OUT INDIVIDUAL FLOW                                            FLOWC91
      WRITE (6,60) K                                                    FLOWC92
   60 FORMAT(1H1, 'INDIVIDUAL FLOW NUMBER', I3//' PT.NO.',              FLOWC93
     1       T19,'VN', T39, 'VT',  T58, 'SIGMA')                        FLOWC94
      DO 70 I = 1,N                                                     FLOWC95
      IF(K.EQ.1) V1(I) = VT(I)
      IF(K.EQ.2) V2(I) = VT(I)
      IF(K.EQ.3) V3(I) = VT(I)
      IF(K.EQ.4) V4(I) = VT(I)
      IF(K.EQ.5) V5(I) = VT(I)
   70 WRITE(6,80) I, VN(I), VT(I), SIG(I)                               FLOWC96
```

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```
   80 FORMAT(1H , I4, 3(8XF12.6))
C
C
   90 CONTINUE
C
C  INDIVIDUAL FLOWS COMPLETE.  NOW DO COMBINED FLOW
C
      REWIND IF10
      DO 110 I = 1,N
      CALL  GETT(IF10, 1, N, A,  1, VNA)
      CALL  GETT(IF10, 1, N, B,  1, VNA)
C
      VNA  = 0.0
      VTB  = 0.0
      DO 100 J = 1,N
      VNA  = VNA + A(J)*CSIG(J)
  100 VTB  = VTB + B(J)*CSIG(J)
C
      VN(I) = VNC(I) + VNA
      VT(I) = VTC(I) + VTB
  110 CONTINUE
C
C
C  PRINT THE OUTPUT DATA  (PER BODY).
      ALPH = ALPHA*0.017453293
      COSA = COS(ALPH)
      SINA = SIN(ALPH)
      CMT  = 0.0
      XM  = 0.0
      YM  = 0.0
      NI  = 0
      NF  = 0
C
C
      DO 160 IB = 1,IBTOT
      IF (IBMF(IB) .LT. 0)  GO TO 160
      NB  = NL(IB)
      NI  = NF
      NF  = NF + NB
      J2  = NI
      S  = 0.0
      SI  = 0.0
      I  = 0
      CX  = 0.0
      CN  = 0.0
      CML= 0.0
C
      IF (NROT .NE. 0) ROT2 = ROTRAD(IB)**2
C
  170 J1 = J2 + 1
      J2 = J1 + 40
      IF (J2 .GT. NF)  J2 = NF
      WRITE(IF06,130)(FTITLE(I),I=1,11),
     1                      ALPHA, ALPHAO, IBTOT, CLT, CCL,
     1   NELTOT, IDB(IB), (BTITLE(IB,II),II=1,7),  NB
C
  130 FORMAT(1H1,"   DOUGLAS  AIRCRAFT  COMPANY  TWO-DIMENSIONAL ",
```

```
     1     'POTENTIAL  FLOW  PROGRAM'/1H0,'COMBINED  FLOW    ', 11A6/
     2     1H0, 'ALPHA =', F11.6, T30,'ALPHA 0 =', F11.6,
     3     T60,'NO.  OF  BODIES   ', I2/
     4     1H0, '  CL  =', F11.6, T30,'  CHORD =', F11.6,
     5     T60,'TOTAL  ELEMENTS  ',  I3/
     6     1H0,'BODY ID = ', I2, T20, 7A4, T60,'NO. OF ELEMENTS  ', I3/
     7     1H0, T4,'I', T14,'X', T28,'Y', T42,'S', T56,'VT',
     8     T70,'CP', T93,'J', T101,'SIGMA', T117,'VN')
C
      DO 140 J = J1,J2
      I = I + 1
      SD = DS(J)/(2.0*SUMDS(IB))
      S = S1 + SD
      S1 = S + SD
      CP = 1.0 - VT(J)**2
      CPJ(J) = CP
      DCP = 0.0
      IF (NROT .EQ. 0)  GO TO 145
      DCP = (X(J)**2 + Y(J)**2)/ROT2
      DCP = DCP - 2.0*(X(J)*SINA - Y(J)*COSA)/ROTRAD(IB)
  145 CP = CP + DCP
      T = CP*DS(J)
      CN = CN - T*CA(J)
      CX = CX + T*SA(J)
      CML = CML + T*(CA(J)*(X(J)-XM) + SA(J)*(Y(J)-YM))
      IF (IPUN .EQ. 7)  WRITE(7, 155)  X (J), Y (J), CP, I
  140 WRITE(IF06,150) I, X (J), Y (J), S, VT(J), CP, J, CSIG(J), VN(J)
  150 FORMAT(1H , I3, 5(3XF11.6), 16XI3, 2(3XF11.6))
C
  155 FORMAT(3F10.5, 46XI4)
C
      IF (J2 .NE. NF)  GO TO 120
      CLI = CN*COSA - CX*SINA
      CDI = CN*SINA + CX*COSA
      WRITE(6,200)  CN, CX, CLI, CDI, CML
  200 FORMAT(1H0,17HINTEGRATED VALUES/
     1        1H0, 5HCY = , F10.5, 5X5HCX = , F10.5/
     2        1H0, 5HCL = , F10.5, 5X5HCD = , F10.5, 5X5HCM = , F10.5)
      CMT = CMT + CML
C
C
  160 CONTINUE
      WRITE(6,210)  CMT
      REWIND 7
      WRITE(7,1500) (X(J),J=1,N)
      WRITE(7,1500) (Y(J),J=1,N)
      WRITE(7,1500) (V1(J),J=1,N)
      WRITE(7,1500) (V2(J),J=1,N)
      WRITE(7,1500) (V3(J),J=1,N)
      WRITE(7,1500) (V4(J),J=1,N)
      WRITE(7,1500) (V5(J),J=1,N)
  210 FORMAT(1H0,11HTOTAL CM = , F10.5)
 1500 FORMAT(0P6E13.8)
C
      RETURN
      END
```

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```
      SUBROUTINE  MAIN1                                                 MAN1C01
C                                                                       MAN1CC2
      DIMENSION  XO(500),YO(500),DS(500),SA(500),CA(500),               MAN1003
     1          ELGC(3500), ELGD(500)                                   MAN1CC4
C                                                                       MAN1CC5
      COMMON/TITL/TTITL(9,6)
      COMMON/PICTUR/VPERIN,XX,XMIN,EXEP,YY,YMIN,ORD
      COMMON /BFLAG/ IDB(10), INL(10), IFL(10), NL(10), LIFT(10),       MAN1CC6
     1              IBMF(10), ISAV1(10), ISAV2(10), ISAV3(10),          MAN1CC7
     2              BTITLE(10,  7), IBT, IBST, IBTOT, NELTOT,           MAN1CO8
     3              ITRB(10), INMB(10), CHORDB(10), IBD(10), LIFTOT     MAN1CO9
     4              ,IPRB(10), IFST(10), ISEC(10), FTITLE(15), IPVR(10) MAN101C
C                                                                       MAN1011
C                                                                       MAN1C12
C                                                                       MAN1013
      COMMON /COMBOD/CCL, INCLT, CLT, ALPHA, SUMDS(10), TLU(10,12),IND  MAN1C14
     1              , ALPHAO, CNU(10), SMDSWF(10), HIO(10)              MAN1C15
C                                                                       MAN1016
      COMMON /FILEID/ IFILE1, IFILE2, IFILE3, IFILE4, IFILE5,           MAN1017
     1                IFILE6, IFILE7, IFILE8, IFILE9, IFIL10,           MAN1018
     2                IFIL11, IFIL12, IFIL13, IFIL14, IFIL15            MAN1C19
     3               ,IFIL16, IFIL17, IFIL18, IFIL19, IFIL20            MAN1C2C
      COMMON /MDATA/ ISOL,IOFF,NONU,NBNU,IPRINT,MORE,M                  MAN1C21
      COMMON /ELDATA/ XO, YO, DS, SA, CA, CURV(500), DL(500)            MAN1C22
      COMMON /GCOFFS/ WF(500)                                           MAN1C23
      EQUIVALENCE  (ELGC(1), XO(1)), (ELGD(1), WF(1))                   MAN1C24
      DATA BLANK,PLABEL/6H      ,6HALPHA=/
C                                                                       MAN1C25
C  FORM ELEMENTS                                                        MAN1C26
      CALL TIMEV(T)                                                     MAN1027
      WRITE(6,20) T                                                     MAN1C28
   20 FORMAT (1H0, 'CALL ELFORM, T = ', F9.3, 'SECONDS.')               MAN1C29
      IF(MORE.NE.1)CALL ELFORM(SUMDS)
C                                                                       MAN1C31
C  READ IN FLOW TITLE CARD                                              MAN1C32
      ITYP = 8                                                          MAN1C33
      READ(5,30) (FTITLE(I),I=1,11),ITYPE
   3C FORMAT (11A6,        5XI1)
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)                      MAN1036
C                                                                       MAN1C37
      DO 35 I=1,9
      TTITL(I,2)=BLANK
35    TTITL(I,1)=FTITLE(I)
      IF(MORE.EQ.1.AND.VPERIN.NE.0..AND.IOFF.EQ.1)CALL PLOT(XX+4.,0.,-3)
C  READ IN FLOW CONTROL CARD                                            MAN1C38
```

```
      ITYP = 9                                                          MAN1C39
      READ (5,40) INCLT, CLT, ICHORD, CCL, IND, ISCL, IOFF, NONU,       MAN1C40
     1      NBNU,VPERIN,IPRINT,MORE,ITYPE
      IF(VPERIN.NE.C.) CALL PLOTIO
   40 FORMAT (I1, 4XF10.5, 2XI1, 2XF10.5, 5(4XI1),F9.3,I1,4XI1, 1XI1)   M
      IF (ITYPE .NE. ITYP)  CALL TYPE(ITYP, ITYPE)                      MAN1C43
      IF(VPERIN.EQ.0.)GOTO 45
      READ(5,191)XX,XMIN,EXEP,YY,YMIN,ORD
191   FORMAT(8F10.3)
      CALL PLOXIS(XX,YY,EXEP,ORD,XMIN,YMIN,.15,.1,C,0,1,2,1,1)
      NSTART =1
      DO 43 IBOD=1,IBT
      IPS=IFL(IBOD)-INL(IBOD)
      CALL DRAW(IPS,NSTART)
43    NSTART=NSTART+IPS+1
      CALL NOTES(CLT,PLABEL,1)
45    IF (NONU .NE. 0) ISOL = 1                                         MAN1C44
      IF (INCLT .EQ. 0)  ALPHA = CLT                                    MAN1C45
      IF (ICHORD .EQ. 0)  CCL = 1.0                                     MAN1C46
C                                                                       MAN1C47
C  FORM MATRICES                                                        MAN1C48
      CALL TIMEV(T)                                                     MAN1C49
      WRITE(6,50) T                                                     MAN1C50
   50 FORMAT (1H0, 'ELFORM COMPLETE, CALL MAFORM, T = ',F9.3,'SECONDS.')MAN1C51
      CALL  MAFORM     ( M, NONU, NBNU, ISOL, IPRINT)                   MAN1C52
C                                                                       MAN1C53
      CALL TIMEV(T)                                                     MAN1C54
      WRITE (6,60) T                                                    MAN1C55
   60 FORMAT (1H0, 'MAFORM COMPLETE, CALL SOLVE, T = ',F9.3,'SECONDS.') MAN1C56
C                                                                       MAN1C57
      CALL  ASSEMB                                                      MAN1C58
C                                                                       MAN1C59
C  SAVE ELDATA AND GCOEFS DATA                                          MAN1C60
      REWIND  IFIL16                                                    MAN1C61
      WRITE(IFIL16) ELGC, ELGD                                          MAN1C62
C                                                                       MAN1C63
      RETURN                                                            MAN1C64
      END                                                               MAN1C65
```

PROGRAM COMBIN-2D

```
C
C
C   THIS IS THE MAIN PROGRAM WHICH CALLS THE SUBROUTINES TO
C   COMPUTE THE 2-D COMBINATION SOLUTIONS FOR BOTH COMPRESSIBLE
C   AND INCOMPRESSIBLE VERSIONS.
C
C
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               ELND,ANG(700),AR(700),AROFF(200)
      COMMON /VELOC/ V1(700),V2(700),V3(700),V4(700),V5(700),V1X(200),
     1               V2X(200),V3X(200),V4X(200),V5X(200),V1Y(200),
     2               V2Y(200),V3Y(200),V4Y(200),V5Y(200)
      COMMON /CONT/ VC,VS1,VS2,XMC,XMC1,XMC2,WDOTC,WDOTC1,WDOTC2,
     1               TITLE(3),VINF,ALFA,A,B,C,D,A1C,A2C,A3C,A4C,A5C,A11,
     2               A21,A31,A41,A51,A12,A22,A32,A42,A52,VIC,VIC1,VIC2
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2               IHUB
      COMMON /CONDIT/ TTOTAL,PT,PSTAT,TSTAT,PSTATC,ATOTAL,PTC,RHOST,
     1               RHOTOT,ASTAT,QCINF
      COMMON /WRIT/  AA1C,AA2C,AA3C,AA4C,AA5C,AA11,AA21,AA31,AA41,AA51,
     1               AA12,AA22,AA32,AA42,AA52
      COMMON /SOLUT/ VBAR(700),VBARO(200),VINC(700),VXINC(200),
     1               VYINC(200),RHOB(700),RBORT(700),RHOBO(200),
     2               VCOM(700),REOOT(200),VRE(200),VRECOM(200),
     3               VXCOM(200),VYCOM(200),THETA(200),PSOPTC(700),
     4               PSOPT(700),CMACH(700),XMACH(700),CPI(700),CPC(700),
     5               RHOI(700)
      COMMON /SOLUTO/ PSOFPC(200),PSOFP(200),CMACO(200),XMACO(200),
     1               RHOOI(200)
```

```
      COMMON /PICT/ VPERIN,XX,XMIN,FXEP,YY,YMIN,OPD,EMSTOR,AL,AAAA
      COMMON /CLPLOT/ XPEN,YPEN,NX6,NY,IPEN,XLABEL(10),YLABEL(10)
C ---------------------------------------------------------------------
      DIMENSION XPLOT(700),YPLOT(700),KKK(8),P(14)
      CALL INPTR
      CALL SEARCH
      CALL ANGLEF
      AAAA=VINF
      VSAVE = VINF
      IF(ICOMP1.EQ.1) ICOMP=0
      IF(ICOMP1.EQ.0) ICOMP=1
      IF(ICOMP .EQ.1) VINF=VINF*(1.0-0.2*(VINF/ATOTAL)**2)**2.5
      VCSAVE=VC
      VC1S=VS1
      VC2S=VS2
      VC=VIC
      VS1=VTC1
      VS2=VIC2
    1 CALL SOLVE
      VC = VCSAVE
      VS1=VC1S
      VS2=VC2S
      VINFP=VINF
      VINF=VSAVE
      IF(IHUE.EQ.0) GO TO 11
      WRITE(6,100)
      IF(M1.EQ.1) WRITE(6,105) A11,A21,A31,A41,A51,A12,A22,A32,
     1                         A42,A52
      IF(M2.EQ.1) WRITE(6,110) A1C,A2C,A3C,A4C,A5C,A12,A22,A32,
     1                         A42,A52
      IF((M1.EQ.0).AND.(M2.EQ.0)) WRITE(6,115) A1C,A2C,A3C,A4C,A5C,
     1                         A11,A21,A31,A41,A51
      WRITE(6,120) A,B,C,D,VINFP
      GO TO 12
   11 WRITE(6,101)
      WRITE(6,102) A1C,A2C,A3C,A4C
      WRITE(6,103) A,B,C,VINFP
   12 IF(ICOMP.EQ.1) CALL COMCOP
      CALL ONBODY
      CALL OFBDY
C
C THE FOLLOWING CODE PLOTS PS/PT VS S AND MACH NUMBER VS S.
C
      IF(CUTOF1.LE.0.0) GO TO 20
      DO 15 I=1,NS1
      IF(S(I).LT.0.0) S1(I)=-S(I)/CUTOF1
      IF(S(I).GE.0.0) S1(I)= S(I)/CUTOF1
   15 CONTINUE
      J=1
      J1=0
```

```
      DO 16 I=1,NS1
      IF(S1(I).GT.1.0) GO TO 16
      IF(I.LT.NXHI1) J=J+1
      IF(J.EQ.1) IS=I
      IF(I.GE.NXHI1) J1=J1+1
   16 CONTINUE
      IPL=1
      CALL PLTER(J1,J,NXHI1,IS,1)
   20 IF(CUTOFH.LE.0.0) GO TO 30
      IN=NS1+1
      IT=NH
      DO 25 I=IN,IT
      IF(S(I).LT.0.0) S1(I)=-S(I)/CUTOFH
      IF(S(I).GE.0.0) S1(I)= S(I)/CUTOFH
   25 CONTINUE
      J=0
      J1=0
      DO 26 I=IN,IT
      IF(S1(I).GT.1.0) GO TO 26
      IF(I.LE.NXHI2) J=J+1
      IF(J.EQ.1) IS=I
      IF(I.GT.NXHI2) J1=J1+1
   26 CONTINUE
      IPL=2
      CALL PLTER(J1,J,NXHI2,IS,1)
   30 IF(CUTOFZ.LE.0.0) GO TO 37
      IN=NH+1
      DO 35 I=IN,NT
      IF(S(I).LT.0.0) S1(I)=-S(I)/CUTOFZ
      IF(S(I).GE.0.0) S1(I)= S(I)/CUTOFZ
   35 CONTINUE
      J=0
      J1=0
      DO 36 I=IN,NT
      IF(S1(I).GT.1.0) GO TO 36
      IF(I.LE.NXHI3) J=J+1
      IF(J.EQ.1) IS=I
      IF(I.GT.NXHI3) J1=J1+1
   36 CONTINUE
      IPL=3
      CALL PLTER(J,J1,NXHI3,IS,2)
   37 IPL=10
      IF(VPERIN.EQ.0) GO TO 40
      KKK(1) = 4
      KKK(2) = 0
      KKK(3) = 3
      IF(IHUB.EQ.0) KKK(3) = 2
      KKK(4) = 1
      KKK(5) = 1
      P(1) = 3.0
      P(2) = XX
      P(3) = XMIN
      P(4) = XMIN+XX*EXEP
      P(5) = YY
      P(6) = YMIN
      P(7) = YMIN+YY*ORD
      P(8) = 1..0
```

```
      P(9) = 0.0
      P(10) = 0.0
      P(11) = 0.0
      P(12) = 0.0
      P(13) = 0.0
      P(14) = 90.0
      II=0
      III=0
      DO 200 I=1,NS1
      IF(XON(I).LT.XMIN) GO TO 200
      IF(YON(I).LT.YMIN) GO TO 200
      IF(XON(I)-XX*EXEP-XMIN) 130,130,200
  130 IF(YON(I)-YY*ORD-YMIN) 135,135,200
  135 II=II+1
      III=III+1
      XPLOT(III)=XON(I)
      YPLOT(III)=YON(I)
  200 CONTINUE
      KKK(6)=II
      II=0
      IF(IHUB.EQ.0) GO TO 250
      NN=NS1+1
      DO 240 I=NN,NH
      IF(XON(I).LT.XMIN) GO TO 240
      IF(YON(I).LT.YMIN) GO TO 240
      IF(XON(I)-XX*EXEP-XMIN) 230,230,240
  230 IF(YON(I)-YY*ORD-YMIN) 235,235,240
  235 II=II+1
      III=III+1
      XPLOT(III)=XON(I)
      YPLOT(III)=YON(I)
  240 CONTINUE
      KKK(7) = II
  250 II=0
      NN=NH+1
      DO 270 I=NN,NT
      IF(XON(I).LT.XMIN) GO TO 270
      IF(YON(I).LT.YMIN) GO TO 270
      IF(XON(I)-XX*EXEP-XMIN) 260,260,270
  260 IF(YON(I)-YY*ORD-YMIN) 265,265,270
  265 II=II+1
      III=III+1
      XPLOT(III)=XON(I)
      YPLOT(III)=YON(I)
  270 CONTINUE
      IF(IHUB.EQ.0) KKK(7)=II
      IF(IHUB.NE.0) KKK(8)=II
      DO 280 I=1,3
      XLABEL(I)=TITLE(I)
  280 CONTINUE
      XPEN=0.0
      YPEN=0.0
      IPEN=-3
      NX6=-18
      NY=0
      CALL CALPLT(XPLOT,YPLOT,KKK,P)
   40 STOP
```

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```
100 FORMAT(/,16X,'V1',12X,'V2',12X,'V3',12X,'V4',12X,'V5',/)
101 FORMAT(/,16X,'V1',12X,'V2',12X,'V3',12X,'V4',/)
102 FORMAT(2X,'CONTROL',3X,4(1PE10.3,4X))
103 FORMAT(/,10X,'A',13X,'B',13X,'C',11X,'VINFP',/,6X,4(1PE10.3,4X))
105 FORMAT(2X,'LOWER',/,2X,'PASSAGE',3X,5(1PE10.3,4X),/,2X,'UPPER',/,
   1        2X,'PASSAGE',3X,5(1PE10.3,4X))
110 FORMAT(2X,'CONTROL',3X,5(1PE10.3,4X),/,2X,'UPPER',/,2X,'PASSAGE',
   1        3X,5(1PE10.3,4X))
115 FORMAT(2X,'CONTROL',3X,5(1PE10.3,4X),/,2X,'LOWER',/,2X,'PASSAGE',
   1        3X,5(1PE10.3,4X))
120 FORMAT(/,10X,'A',13X,'B',13X,'C',13X,'D',11X,
   1          'VINFP',/,6X,5(1PE10.3,4X))
    END
```

C-3

```
      SUBROUTINE INPTR
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               ELND,ANG(700),AR(700),AROFF(200)
      COMMON /VELOC/ V1(700),V2(700),V3(700),V4(700),V5(700),V1X(200),
     1               V2X(200),V3X(200),V4X(200),V5X(200),V1Y(200),
     2               V2Y(200),V3Y(200),V4Y(200),V5Y(200)
      COMMON /CONT/ VC,VS1,VS2,XMC,XMC1,XMC2,WDOTC,WDOTC1,WDOTC2,
     1               TITLE(3),VINF,ALFA,A,B,C,D,A1C,A2C,A3C,A4C,A5C,A11,
     2               A21,A31,A41,A51,A12,A22,A32,A42,A52,VIC,VIC1,VIC2
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2               IHUB
      COMMON /CONDIT/ TTOTAL,PT,PSTAT,TSTAT,PSTATC,ATOTAL,PTC,RHOST,
     1               RHOTOT,ASTAT,QCINF
      COMMON/PICT/VPERIN,XX,XMIN,EXEP,YY,YMIN,OPD,EMSTOR,AL,AAAA
C ---------------------------------------------------------------------
C
C   THIS SUBROUTINE READS DATA FROM BOTH CARDS AND DISK FILES.
C
      READ(5,100) TITLE
      WRITE(6,101) TITLE
      READ(5,110)  NT,NS1,NH,NP,IW,NX,KND,ICOMP1,IHUB
      WRITE(6,111) NT,NS1,NH,NP,IW,NX,KND,ICOMP1,IHUB
      READ(5,120)  VC,VS1,VS2,VINF,ALFA,XMC,XMC1,XMC2,TTOTAL,PT
      WRITE(6,121) VC,VS1,VS2,VINF,ALFA,XMC,XMC1,XMC2,TTOTAL,PT
      READ(5,120)  ELND,WDOTC,WDOTC1,WDOTC2,PSTAT,TSTAT,CUTOF1,CUTOF2,
     1             CUTOFH,VPERIN
      WRITE(6,121) ELND,WDOTC,WDOTC1,WDOTC2,PSTAT,TSTAT,CUTOF1,CUTOF2,
     1             CUTOFH,VPERIN
      IF(VPERIN.NE.0) READ(5,130) XX,XMIN,EXEP,YY,YMIN,OPD
      IF(VPERIN.NE.0) WRITE(6,131) XX,XMIN,EXEP,YY,YMIN,OPD
C
C  NT = TOTAL NUMBER OF ON-BODY POINTS.
C  NS1 = TOTAL NUMBER OF ON-BODY POINTS ON LOWER SHROUD
C  NH = TOTAL NUMBER OF ON-BODY POINTS ON LOWER SHROUD AND
C       HUB.
C  IW = 0 - WEIGHT FLOW DATA AT CONTROL STATIONS INPUT
C     = 1 - MACH NUMBERS AT CONTROL STATIONS INPUT
C     = 2 - VELOCITIES AT CONTROL STATIONS INPUT
C  NX = 1 SUPERSONIC VELOCITY CORRECTION APPLIES.
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C   KND = C DATA NOT SCALED.
C       = 6 DATA SCALED BY CONTROL STATION PASSAGE HEIGHT.
C   ICOMPI = C COMPRESSIBLE VERSION
C          = 1 INCOMPRESSIBLE VERSION
C   NOTE -- TWO OF THE THREE CONTROL STATIONS' DATA MUST BE INPUT, IF IHUB NE C
C   IHUB = C NO HUB
C
C
        READ(5,140)  XTEST,YCL,YCU
        WRITE(6,141) XTEST,YCL,YCU
        IF(IHUB.EQ.0) GO TO 3
        READ(5,140)  XTEST1,YCL1,YCU1
        WRITE(6,141) XTEST1,YCL1,YCU1
        READ(5,140)  XTEST2,YCL2,YCU2
        WRITE(6,141) XTEST2,YCL2,YCU2
      3 READ(5,140)   XR1,XR2,XRH
        WRITE(6,141)  XR1,XR2,XRH
        READ(5,140)   YR1,YR2,YRH
        WRITE(6,141)  YR1,YR2,YRH
C   XTEST,XTEST1,XTEST2 ARE THE LOCATIONS OF THE CONTROL STATIONS
C   DOWNSTREAM OF THE HUB, BETWEEN THE HUB AND LOWER SHROUD,
C   AND BETWEEN THE HUB AND UPPER SHROUD, RESPECTIVELY.
C   XR1,XRH,XR2 ARE THE POINTS ON EACH OF THE BODIES WHERE
C   SURFACE DISTANCE EQUALS ZERO.
        READ(7,150) (XON(J),J=1,NT)
        READ(7,150) (YON(J),J=1,NT)
        READ(7,150) (V1(J),J=1,NT)
        READ(7,150) (V2(J),J=1,NT)
        READ(7,150) (V3(J),J=1,NT)
        READ(7,150) (V4(J),J=1,NT)
        READ(7,150) (V5(J),J=1,NT)
        IF(NP.GT.100) GO TO 4
        READ(7,150) (XOFF(J),J=1,NP)
        READ(7,150) (YOFF(J),J=1,NP)
        READ(7,150) ( V1X(J),J=1,NP)
        READ(7,150) ( V2X(J),J=1,NP)
        READ(7,150) ( V3X(J),J=1,NP)
        READ(7,150) ( V4X(J),J=1,NP)
        READ(7,150) ( V5X(J),J=1,NP)
        READ(7,150) ( V1Y(J),J=1,NP)
        READ(7,150) ( V2Y(J),J=1,NP)
        READ(7,150) ( V3Y(J),J=1,NP)
        READ(7,150) ( V4Y(J),J=1,NP)
        READ(7,150) ( V5Y(J),J=1,NP)
        GO TO 5
      4 READ(7,150) (XOFF(J),J=1,100)
        READ(7,150) (YOFF(J),J=1,100)
        READ(7,150) ( V1X(J),J=1,100)
        READ(7,150) ( V2X(J),J=1,100)
        READ(7,150) ( V3X(J),J=1,100)
        READ(7,150) ( V4X(J),J=1,100)
        READ(7,150) ( V5X(J),J=1,100)
        READ(7,150) ( V1Y(J),J=1,100)
        READ(7,150) ( V2Y(J),J=1,100)
        READ(7,150) ( V3Y(J),J=1,100)
        READ(7,150) ( V4Y(J),J=1,100)
        READ(7,150) ( V5Y(J),J=1,100)
```

```
      READ(7,150) (XOFF(J),J=101,NP)
      READ(7,150) (YOFF(J),J=101,NP)
      READ(7,150) ( V1X(J),J=101,NP)
      READ(7,150) ( V2X(J),J=101,NP)
      READ(7,150) ( V3X(J),J=101,NP)
      READ(7,150) ( V4X(J),J=101,NP)
      READ(7,150) ( V5X(J),J=101,NP)
      READ(7,150) ( V1Y(J),J=101,NP)
      READ(7,150) ( V2Y(J),J=101,NP)
      READ(7,150) ( V3Y(J),J=101,NP)
      READ(7,150) ( V4Y(J),J=101,NP)
      READ(7,150) ( V5Y(J),J=101,NP)
    5 WRITE(6,160) TITLE
      WRITE(6,170)
      IF(ICOMP1.EQ.0) WRITE(6,180)
      IF(ICOMP1.EQ.1) WRITE(6,175)
      IF(IHUB.EQ.0) WRITE(6,189)
      IF(IHUB.NE.0) WRITE(6,190)
      IF(ELND.EQ.0.0) ELND=1.0
      AL = ALFA
      CALL CONST
C   THE FOLLOWING SCALES THE DATA BY THE VALUE OF ELND.
      DO 10 I=1,NT
      XON(I)=XON(I)/ELND
      YON(I)=YON(I)/ELND
   10 CONTINUE
      DO 20 I=1,NP
      XOFF(I)=XOFF(I)/ELND
      YOFF(I)=YOFF(I)/ELND
   20 CONTINUE
      RETURN
C   *****FORMATS*****
  100 FORMAT(3A6)
  101 FORMAT(1H ,3A6)
  110 FORMAT(9I4)
  111 FORMAT(1H ,9I4)
  120 FORMAT(0P10F8.0)
  121 FORMAT(1H ,0P10F8.3)
  130 FORMAT(0P6F10.0)
  131 FORMAT(1H ,0P6F10.3)
  140 FORMAT(0P3F10.0)
  141 FORMAT(1H ,0P3F10.3)
  150 FORMAT(0P6E13.8)
  160 FORMAT(1H1,40X,3A6)
  170 FORMAT(///,2X,'2-D COMBINATION SOLUTION')
  175 FORMAT(/,6X,'INCOMPRESSIBLE VERSION')
  180 FORMAT(/,6X,  'COMPRESSIBLE VERSION')
  189 FORMAT(/,6X,'COMBINATION OF THE FOLLOWING BASIC SOLUTIONS',/,9X,
     1          '1. UNIFORM AXIAL',/,9X,'2. UNIFORM CROSSFLOW',/,9X,
     2          '3. VORTICITY ABOUT LOWER SHROUD',/,9X,'4. VORTICITY ABOU
     3T UPPER SHROUD',/)
  190 FORMAT(/,6X,'COMBINATION OF THE FOLLOWING BASIC SOLUTIONS',/,9X,
     1          '1. UNIFORM AXIAL',/,9X,'2. UNIFORM CROSSFLOW',/,9X,
     2          '3. VORTICITY ABOUT LOWER SHROUD',/,9X,'4. VORTICITY ABOU
     3T HUB',/,9X,'5. VORTICITY ABOUT UPPER SHROUD',/)
      END
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      SUBROUTINE CONST
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               ELND,ANG(700),AR(700),AROFF(200)
      COMMON /CONT/ VC,VS1,VS2,XMC,XMC1,XMC2,WDOTC,WDOTC1,WDOTC2,
     1               TITLE(3),VINF,ALFA,A,B,C,D,A1C,A2C,A3C,A4C,A5C,A11,
     2               A21,A31,A41,A51,A12,A22,A32,A42,A52,VIC,VIC1,VIC2
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2               IHUB
      COMMON /CONDIT/ TTOTAL,PT,PSTAT,TSTAT,PSTATC,ATOTAL,PTC,RHOST,
     1               RHOTOT,ASTAT,QCINF
C ----------------------------------------------------------------------
C
C  THIS SUBROUTINE CALCULATES THE CONSTANTS USED IN THE PROGRAM
C
      PI=3.141592654
      M1=0
      M2=0
      IF(IHUB.EQ.0) GO TO 5
      IF((IW.EQ.0).AND.(WDOTC.EQ.0.0)) M1=1
      IF((IW.EQ.0).AND.(WDOTC1.EQ.0.0)) M2=1
      IF((IW.EQ.1).AND.(XMC.EQ.0.0)) M1=1
      IF((IW.EQ.1).AND.(XMC1.EQ.0.0)) M2=1
      IF((IW.EQ.2).AND.(VC.EQ.0.0)) M1=1
      IF((IW.EQ.2).AND.(VS1.EQ.0.0)) M2=1
    5 PIO180=PI/180.0
      R21568= 1716.56
      G = 32.174
      PSTATC = PSTAT
      IF((PSTAT.NE.0.0).AND.(TSTAT.NE.0.0)) GO TO 10
      IF(PT.EQ.0.0) PT = 2116.23
      IF(TTOTAL.EQ.0.0) TTOTAL = 518.69
      ATOTAL = 49.009*SQRT(TTOTAL)
      CATOT = 1.0-0.2*(VINF/ATOTAL)**2
      PSTATC = PT*CATOT**3.5
      PTC = PT
      RHOTOT = PT/(R21568*TTOTAL)
      TSTAT = TTOTAL*CATOT
      RHOST = PSTATC/(R21568*TSTAT)
      PSTAT = PT-0.5*RHOTOT*VINF*VINF
      ASTAT = 49.009*SQRT(TSTAT)
```

```
      GO TO 15
   10 ASTAT = 49.009*SQRT(TSTAT)
      RHOST = PSTAT/(R21568*TSTAT)
      AMINF = VINF/ASTAT
      CAMINF = 1.0+0.2*AMINF**2
      PTC = PSTAT*CAMINF**3.5
      PSTAT = PTC-0.5*RHOTOT*VINF*VINF
      PT=PTC
      TTOTAL = TSTAT*CAMINF
      RHOTOT = PT/(R21568*TTOTAL)
      ATOTAL = 49.009*SORT(TTOTAL)
   15 AC = YCU-YCL
      VSONIC = ATOTAL/1.726
      VSONCC = ATOTAL/SORT(1.2)
      IF(IHUB.EQ.0) GO TO 16
      AS1 = YCU1-YCL1
      AS2 = YCU2-YCL2
      IF((IW.EQ.0).AND.(WDOTC.EQ.0.0)) WDOTC = WDOTC1+WDOTC2
      IF((IW.EQ.0).AND.(WDOTC1.EQ.0.0)) WDOTC1 = WDOTC-WDOTC2
      IF((IW.EQ.0).AND.(WDOTC2.EQ.0.0)) WDOTC2 = WDOTC-WDOTC1
   16 IF(IW.EQ.1) GO TO 40
      GO TO 50
   40 VC = ATOTAL*XMC/SORT(1.0+XMC**2/5.0)
      IF(IHUB.EQ.0) GO TO 25
      VS1 = ATOTAL*XMC1/SQRT(1.0+XMC1**2/5.0)
      VS2 = ATOTAL*XMC2/SQRT(1.0+XMC2**2/5.0)
      GO TO 25
   50 IF(IW.EQ.2) GO TO 25
      VIC = WDOTC/(G*RHOTOT*AC)*12.0
      CALL VEARIT(VIC,ATOTAL,RHOTOT,RHOC)
      VC = WDOTC/(G*RHOC*AC)*12.0
      IF(IHUB.EQ.0) GO TO 25
      VIC1 = WDOTC1/(G*RHOTOT*AS1)*12.0
      VIC2 = WDOTC2/(G*RHOTOT*AS2)*12.0
      CALL VEARIT(VIC1,ATOTAL,RHOTOT,RHOC1)
      CALL VEARIT(VIC2,ATOTAL,RHOTOT,RHOC2)
      VS1 = WDOTC1/(G*RHOC1*AS1)*12.0
      VS2 = WDOTC2/(G*RHOC2*AS2)*12.0
   25 IF(VC.GT.VSONCC) WRITE(6,116) VC
      IF(VC.GT.VSONCC) VC = VSONCC
      IF(IHUB.EQ.0) GO TO 26
      IF(VS1.GT.VSONCC) WRITE(6,117) VS1
      IF(VS1.GT.VSONCC) VS1 = VSONCC
      IF(VS2.GT.VSONCC) WRITE(6,118) VS2
      IF(VS2.GT.VSONCC) VS2 = VSONCC
   26 IF(KND.GE.8) GO TO 35
   35 IF((KND.EQ.-1).OR.(KND.EQ.4)) ELND = YCU
      IF((KND.EQ. 1).OR.(KND.EQ.6)) ELND = YCU-YCL
      IF((KND.EQ. 0).OR.(KND.EQ.5)) ELND = 1.0
      AC = AC/ELND
      YCU = YCU/ELND
      YCL = YCL/ELND
      XR1 = XR1/ELND
      XR2 = XR2/ELND
      YR1 = YR1/ELND
      YR2 = YR2/ELND
      XTEST = XTEST/ELND
```

```
      IF(IHUB.EQ.0) GO TO 35
      AS1 = AS1/ELND
      AS2 = AS2/ELND
      YCU1 = YCU1/ELND
      YCU2 = YCU2/ELND
      YCL1 = YCL1/ELND
      YCL2 = YCL2/ELND
      XRH = XRH/ELND
      YRH = YRH/ELND
      XTEST1 = XTEST1/ELND
      XTEST2 = XTEST2/ELND
   35 PTTOT = R21568*TTOTAL
      GRHO = G*PT/TTOTAL
      C1G2RT = 0.5*RHOST/PT
      VFOAT = VINF/ATOTAL
      VCOAT = VC/ATOTAL
      VS1OAT = VS1/ATOTAL
      VS2OAT = VS2/ATOTAL
      CON1 = 1.0-0.2*VCOAT**2
      CON2 = 1.0-0.2*VFOAT**2
      CON11 = 1.0-0.2*VS1OAT**2
      CON21 = 1.0-0.2*VS2OAT**2
      RSORTF = CON2**2.5
      RSORTC = CON1**2.5
      RSORT1 = CON11**2.5
      RSORT2 = CON21**2.5
      IF((IW.EQ.1).OR.(IW.EQ.2)) VIC = VC*RSORTC
      IF((IW.EQ.1).OR.(IW.EQ.2)) VIC1 = VS1*RSORT1
      IF((IW.EQ.1).OR.(IW.EQ.2)) VIC2 = VS2*RSORT2
      IF((IW.EQ.1).OR.(IW.EQ.2)) WDOTC = VIC*G*RHOTOT*AC/12.0
      IF((IW.EQ.1).OR.(IW.EQ.2)) WDOTC1 = VIC1*G*RHOTOT*AS1/12.0
      IF((IW.EQ.1).OR.(IW.EQ.2)) WDOTC2 = VIC2*G*RHOTOT*AS2/12.0
      IF(IHUB.EQ.0) GO TO 36
      F = WDOTC1+WDOTC2
      IF(WDOTC.EQ.0.0) VIC = F/(G*RHOTOT*AC/12.0)
      IF(WDOTC.EQ.0.0) CALL VBARIT(VIC,ATOTAL,RHOTOT,RHOC)
      IF(WDOTC.EQ.0.0) VC = F/(G*RHOC*AC)*12.0
      IF(WDOTC.EQ.0.0) VCOAT = VC/ATOTAL
      IF(WDOTC.EQ.0.0) CON1 = 1.0-0.2*VCOAT**2
      IF(WDOTC.EQ.0.0) RSORTC = CON1**2.5
      IF(WDOTC.EQ.0.0) WDOTC = F
      F = WDOTC-WDOTC2
      IF(WDOTC1.EQ.0.0) VIC1= F/(G*RHOTOT*AS1/12.0)
      IF(WDOTC1.EQ.0.0) CALL VBARIT(VIC1,ATOTAL,RHOTOT,RHOC)
      IF(WDOTC1.EQ.0.0) VS1 = F/(G*RHOC*AS1)*12.0
      IF(WDOTC1.EQ.0.0) VS1OAT = VS1/ATOTAL
      IF(WDOTC1.EQ.0.0) CON11 = 1.0-0.2*VS1OAT**2
      IF(WDOTC1.EQ.0.0) RSORT1 = CON11**2.5
      IF(WDOTC1.EQ.0.0) WDOTC1= F
      F = WDOTC-WDOTC1
      IF(WDOTC2.EQ.0.0) VIC2= F/(G*RHOTOT*AS2/12.0)
      IF(WDOTC2.EQ.0.0) CALL VBARIT(VIC2,ATOTAL,RHOTOT,RHOC)
      IF(WDOTC2.EQ.0.0) VS2 = F/(G*RHOC*AS2)*12.0
      IF(WDOTC2.EQ.0.0) VS2OAT = VS2/ATOTAL
      IF(WDOTC2.EQ.0.0) CON21 = 1.0-0.2*VS2OAT**2
      IF(WDOTC2.EQ.0.0) RSORT2 = CON21**2.5
      IF(WDOTC2.EQ.0.0) WDOTC2= F
```

```
      IF(ICOMP1.EQ.1) VS1 = VIC1
      IF(ICOMP1.EQ.1) VS2 = VIC2
   36 IF(ICOMP1.EQ.1) VC = VIC
      VNFOVC = VINF/VC
      IF(KND.LT.8) WDOTC = WDOTC/ELND
      IF(KND.LT.8) WDOTC1 = WDOTC1/ELND
      IF(KND.LT.8) WDOTC2 = WDOTC2/ELND
      PSPTC = 1.0-C1D2RT*VC**2
      PSPTC1 = 1.0-C1D2RT*VS1**2
      PSPTC2 = 1.0-C1D2RT*VS2**2
      PSPTIF = 1.0-C1D2RT*VINF**2
      PSPTCT = RSORTF*CON2
      PSPT1  = RSORT1*CON11
      PSPT2  = RSORT2*CON21
      PSPTCC = RSORTC*CON1
      XMINF = VFOAT/(CON2**0.5)
      IF(XMC.EQ.0.0) XMC = VCOAT/(CON1**0.5)
      IF(XMC1.EQ.0.0) XMC1 = VS1OAT/(CON11**0.5)
      IF(XMC2.EQ.0.0) XMC2 = VS2OAT/(CON21**0.5)
      QINF = PT*(1.0-PSPTIF)
      QCINF = PTC*(0.7*VFOAT**2*RSORTF)
      QC = PT*(1.0-PSPTC)
      QCC = PTC*(0.7*VCOAT**2*RSORTC)
      QC1 = PT*(1.0-PSPTC1)
      QC2 = PT*(1.0-PSPTC2)
      QC1C = PTC*(0.7*VS1OAT**2*RSORT1)
      QC2C = PTC*(0.7*VS2OAT**2*RSORT2)
      THETC = TTOTAL/518.69
      DEL = PTC/2116.23
      IF(IHUB.EQ.0) GO TO 37
      HBTPR1 = YCU1/YCL1
      HBTPR2 = YCL2/YCU2
      WDOT1R = WDOTC1*SORT(THETC)/DEL
      WDOT2R = WDOTC2*SORT(THETC)/DEL
   37 WDOTCR = WDOTC*SORT(THETC)/DEL
      IF(ICOMP1.EQ.0) GO TO 41
      WRITE(6,101)
      WRITE(6,111) VC,XMC,QC,PSPTC
      IF(IHUB.EQ.0) GO TO 38
      WRITE(6,121) VS1,XMC1,QC1,PSPTC1
      WRITE(6,131) VS2,XMC2,QC2,PSPTC2
   38 WRITE(6,141) VINF,XMINF,QINF,PSPTIF
      GO TO 51
   41 WRITE(6,100)
      WRITE(6,110) VC,XMC,QC,QCC,PSPTC,PSPTCC,RSORTC
      IF(IHUB.EQ.0) GO TO 39
      WRITE(6,120) VS1,XMC1,QC1,QC1C,PSPTC1,PSPT1,RSORT1
      WRITE(6,130) VS2,XMC2,QC2,QC2C,PSPTC2,PSPT2,RSORT2
   39 WRITE(6,140) VINF,XMINF,QINF,QCINF,PSPTIF,PSPTCT,RSORTF
   51 WRITE(6,150)
      WRITE(6,155) ALFA,VNFOVC,VSONIC,VSONCC,WDOTCR,WDOT1R,WDOT2R
      WRITE(6,160)
      WRITE(6,165)
      WRITE(6,170) TSTAT,PSTAT,PSTATC,ASTAT,RHOST,WDOTC,WDOTC1,WDOTC2
      WRITE(6,175) VIC,VIC1,VIC2
      WRITE(6,180)
      WRITE(6,155) TTOTAL,PT,PTC,ATOTAL,RHOTOT,THETC,DEL
```

```
      WRITE(6,160)
      WRITE(6,185)
      WRITE(6,170) XR1,YR1,XR2,YR2,XTEST,YCL,YCU,ELND
      WRITE(6,190)
      WRITE(6,170) XTEST1,YCL1,YCU1,XTEST2,YCL2,YCU2,HBTPR1,HBTPR2
      WRITE(6,210) CUTOF1,CUTOFH,CUTOF2
      WRITE(6,160)
      WRITE(6,200) NT,NP,NS1,NH,KND,IW,NX,ICOMP1,IHUB
      WRITE(6,160)
      ALFA = ALFA*PIO180
C *****FORMATS*****
  100 FORMAT(1H0,27X,'MACH',11X,'DYNAMIC PRESSURE',13X,'PRESSURE RATIO',
     1       8X,'DENSITY RATIO',/,14X,'VELOCITY',7X,'NO.',9X,'INC',10X,
     2       'COMP',11X,'INC',8X,'COMP',/)
  101 FORMAT(1H0,27X,'MACH',11X,'DYNAMIC PRESSURE',13X,'PRESSURE RATIO',
     1 /,14X,'VELOCITY',7X,'NO.',17X,'INC',25X,'INC',/)
  110 FORMAT(3X,'CONTROL   ',1PE10.3,2X,2(1PE10.3,5X,1PE10.3,3X),1PE10.3,
     1       6X,1PE10.3,/)
  111 FORMAT(3X,'CONTROL   ',1PE10.3,2X,1PE10.3,9X,1PE10.3,20X,1PE10.3,/)
  116 FORMAT(2X,'CONTROL STATION VELOCITY = ',1PE13.4,' EXCEEDS VSONIC.'
     1       ,/,' PROCEEDING WITH VC = VSONIC.  IF THE CONTROL STATION '
     2       'IS NOT AT THE THROAT, RESUBMIT WITH A LOWER VC.')
  117 FORMAT(2X,'CONTROL STATION VELOCITY = ',1PE13.4,' EXCEEDS VSONIC.'
     1       ,/,' PROCEEDING WITH VS1 = VSONIC.  RESUBMIT WITH A LOWER '
     2       'VS1.')
  118 FORMAT(2X,'CONTROL STATION VELOCITY = ',1PE13.4,' EXCEEDS VSONIC.'
     1       ,/,' PROCEEDING WITH VS2 = VSONIC.  RESUBMIT WITH A LOWER '
     2       'VS2.')
  120 FORMAT(3X,'LOWER',/,3X,'PASSAGE   ',1PE10.3,2X,2(1PE10.3,5X,1PE10.3
     1       ,3X),1PE10.3,6X,1PE10.3,/)
  121 FORMAT(3X,'LOWER',/,3X,'PASSAGE   ',1PE10.3,2X,1PE10.3,9X,1PE10.3,
     1       20X,1PE10.3,/)
  130 FORMAT(3X,'UPPER',/,3X,'PASSAGE   ',1PE10.3,2X,2(1PE10.3,5X,1PE10.3
     1       ,3X),1PE10.3,6X,1PE10.3,/)
  131 FORMAT(3X,'UPPER',/,3X,'PASSAGE   ',1PE10.3,2X,1PE10.3,9X,1PE10.3,
     1       20X,1PE10.3,/)
  140 FORMAT(3X,'FREE ',/,3X,'STREAM    ',1PE10.3,2X,2(1PE10.3,5X,1PE10.3
     1       ,3X),1PE10.3,6X,1PE10.3,/)
  141 FORMAT(3X,'FREE',/,3X,'STREAM    ',1PE10.3,2X,1PE10.3,9X,1PE10.3,
     1       20X,1PE10.3,/)
  150 FORMAT(/,9X,'ALPHA',9X,'VINF/VC',7X,'VSONIC',8X,'VSONICC',7X,
     1       'WDOTCR',8X,'WDOTLCR',8X,'WDOTUCR')
  155 FORMAT(7X,7(1PE10.3,4X))
  160 FORMAT(/,1X,'--------------------------------------------------'
     1       '---------------------------------------------------',/)
  165 FORMAT(/,9X,'TSTAT',9X,'PSTAT',9X,'PSTATC',8X,'ASTAT',9X,'RHOSTAT'
     1       ,7X,'WDOTC',9X,'WDOTL',7X,'WDOTU')
  170 FORMAT(7X,8(1PE10.3,4X))
  175 FORMAT(/,9X,'VIC',11X,'VICL',10X,'VICU',/,7X,3(1PE10.3,4X))
  180 FORMAT(/,9X,'TTOT',10X,'PTOT',10X,'PTOTC',9X,'ATOT',10X,'RHOTOT',
     1       8X,'THET',10X,'DEL')
  185 FORMAT(/,10X,'XRI1',11X,'YRI1',10X,'XRI2',9X,'YRI2',9X,'XTEST',10X
     1       ,'YCL',11X,'YCU',10X,'LND')
  190 FORMAT(/,9X,'XTEST1',10X,'YCL1',10X,'YCU1',8X,'XTEST2',10X,'YCL2',
     1       10X,'YCU2',5X,'HUB-TIP L',6X,'HUB-TIP U')
  200 FORMAT(/,10X,'NT',5X,'NP',5X,'NS1',5X,'NH',5X,'KND',5X,'IW',5X,
     1       'NX',5X,'ICOMP1',5X,'IHUB',/,9X,I3,4X,I3,5X,I3,4X,I3,5X,
```

```
   2          I3,4X,I3,5X,I2,7X,I1,9X,I1)
210  FORMAT(/,7X,'P-S CUTOFF L',3X,'P-S CUTOFF HUB  P-S CUTOFF U',/,
   1          8X,1PE10.3,5X,1PE10.3,5X,1PE10.3)
     END
```

```
      SUBROUTINE SEARCH
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               ELND,ANG(700),AR(700),AROFF(200)
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2               IHUB
      COMMON /CONT/ VC,VS1,VS2,XMC,XMC1,XMC2,WDOTC,WDOTC1,WDOTC2,
     1               TITLE(3),VINF,ALFA,A,B,C,D,A1C,A2C,A3C,A4C,A5C,A11,
     2               A21,A31,A41,A51,A12,A22,A32,A42,A52,VIC,VIC1,VIC2
      COMMON /CONDIT/ TTOTAL,PI,PSTAT,TSTAT,PSTATC,ATOTAL,PTC,RHOST,
     1               RHOTOT,ASTAT,QCINF
C ----------------------------------------------------------------------
C
C  THIS SUBROUTINE FINDS THE HIGHLIGHT ON EACH BODY AND
C  CALCULATES AREAS FOR ALL THE ON- AND OFF-BODY POINTS.
C
      PI = 3.141592654
C
C  ON-BODY POINT CALCULATIONS
C
      JJ = NS1+1
      JJJ = NH + 1
      DO 10 J = 2,NS1
      IF(XON(J).GE.XON(J-1)) GO TO 10
      NXHI1 = J
   10 CONTINUE
      IF(IHUB.EQ.0) GO TO 21
      J1 = JJ + 1
      J2 = JJJ-1
      DO 20 J =J1,J2
      IF(XON(J).GE.XON(J-1)) GO TO 20
      NXHI2 = J
      XHI2=XON(NXHI2)
   20 CONTINUE
   21 J2 = JJJ+1
      DO 30 J = J2,NT
      IF(XON(J).GE.XON(J-1)) GO TO 30
      NXHI3 = J
   30 CONTINUE
      NST3=NXHI3
      CALL SURF
      IF(IHUB.EQ.0) XHI2=99999.
      YHI2=(YON(NXHI3)+YON(NXHI1))/2.0
      DO 40 J = 1,NXHI1
      R = SQRT((XON(J)-XON(NXHI1))**2 + (YON(J)-YHI2)**2)
```

```
      THETA = ACOS((XON(J)-XON(NXHI1))/R)
      THETAP = THETA + 0.570796*(XON(J)-XON(1))/(XON(NXHI1)-XON(1))
      AR(J) = 2.0*(PI-THETAP)*R
   40 CONTINUE
      I1 = NXHI1+1
      DO 60  I = I1,NS1
      IF((ABS(XON(NXHI1)-XON(NXHI3)).GT.0.01).AND.(XON(I).LT.XON(NXHI3))
     1      .AND.(XON(I).LT.XHI2)) GO TO 45
      IF(XON(I).GT.XHI2) GO TO 50
      NN = NH+1
      CALL INTER(XON,YON,NN,NXHI3,XON(I),Y)
      AR(I) = Y-YON(I)
      NST3 = I
      GO TO 60
   50 CALL INTER(XON,YON,JJ,NXHI2,XON(I),Y)
      AR(I) = Y-YON(I)
      GO TO 60
   45 AR(I) = YON(NXHI3)-YON(I)
      IF(XHI2.LE.XON(NXHI3)) NST3=I
   60 CONTINUE
      IF(IHUB.EQ.0) GO TO 71
      DO 70 I = JJ,NXHI2
      CALL INTER(XON,YON,NST3,NS1,XON(I),Y)
      AR(I) = YON(I)-Y
   70 CONTINUE
   71 DO 80 I = JJJ,NXHI3
      IF(XON(I).LT.XHI2) GO TO 85
      NST7 = I
      JUP = JJJ-1
      CALL INTER(XON,YON,NXHI2,JUP,XON(I),Y)
      AR(I) = YON(I)-Y
      GO TO 80
   85 CALL INTER(XON,YON,NXHI1,NS1,XON(I),Y)
      AR(I) = YON(I)-Y
   80 CONTINUE
      IF(IHUB.EQ.0) GO TO 91
      I1 = NXHI2+1
      JUP = JJJ-1
      DO 90 I = I1,JUP
      NST1 =NST7+1
      CALL INTER(XON,YON,JJJ,NST1,XON(I),Y)
      AR(I) = Y-YON(I)
      IF(XON(I).GE.XON(NXHI3)) GO TO 90
      AR(I)=AR(NXHI3)
   90 CONTINUE
   91 NS = NXHI3+1
      DO 100 I = NS,NT
      R = SQRT((XON(I)-XON(NXHI3))**2+(YON(I)-YHI2)**2)
      THETA = ACOS((XON(I)-XON(NXHI3))/R)
      THETAP = THETA + 0.570796*(XON(I)-XON(NT))/(XON(NXHI3)-XON(NT))
      AR(I) = 2.0*(PI-THETAP)*R
  100 CONTINUE
C
C     OFF-BODY POINT CALCULATIONS
C
      K =0
      NP1=NP-1
```

```
      DO 105 I = 1,NP1
      IF(XOFF(I).LT.XHI2) GO TO 101
      IF(I.EQ.1) GO TO 101
      L=L+1
      IF(L.EQ.L1) GO TO 101
      AA=YOFF(I+1)-YOFF(I)
      AB=YOFF(I)-YOFF(I-1)
      IF(ABS(AA-AB).GT.0.001) GO TO 102
  101 IF(XOFF(I).EQ.XOFF(I+1)) GO TO 105
  102 K=K+1
      NPPR(K) = I
      L=NPPR(K)
      L1=L+1
  105 CONTINUE
      K=K+1
      NPPR(K)=NP
      DO 110 I=1,NP
      IC =0
      IF(I.LE.NPPR(1)) K1=1
      IF(I.LE.NPPR(1)) GO TO 112
      DO 111 J=2,K
      IF((I.LE.NPPR(J)).AND.(I.GT.NPPR(J-1))) K1=J
  111 CONTINUE
  112 IF(XOFF(I).LT.XON(NXHI1)) GO TO 200
      CALL INTER(XON,YON,1,NXHI1,XOFF(I),Y1)
      CALL INTER(XON,YON,NXHI1,NS1,XOFF(I),Y2)
      N1=NS1+1
      CALL INTER(XON,YON,JJJ,NXHI3,XOFF(I),Y3)
      CALL INTER(XON,YON,NXHI3,NT,XOFF(I),Y4)
      IF(IHUB.NE.0) CALL INTER(XON,YON,N1,NXHI2,XOFF(I),Y5)
      IF(XOFF(I).LT.XON(NXHI3)) GO TO 115
      IC=1
  115 IF(IC.EQ.1) GO TO 140
      IF(YOFF(I).GT.Y2) GO TO 120
      GO TO 130
  120 CALL INTER(XON,AR,NXHI1,NS1,XOFF(I),Y)
      AROFF(I)=Y
      IPAK(K1) = 2
      IF(XOFF(I).GT.XHI2) GO TO 180
      GO TO 110
  130 R = SQRT((XOFF(I)-XON(NXHI1))**2+(YOFF(I)-YHI2)**2)
      THETA = ACOS((XOFF(I)-XON(NXHI1))/R)
      THETAP = THETA + 0.570796*(XOFF(I)-XON(1))/(XON(NXHI1)-XON(1))
      AROFF(I) = 2.0 *(PI-THETAP)*R
  135 CONTINUE
      IRAK(K1) = 6
      GO TO 110
  140 IF(YOFF(I).GT.Y1) GO TO 145
      IRAK(K1)=6
      R = SQRT((XOFF(I)-XON(NXHI1))**2+(YOFF(I)-YHI2)**2)
      THETA = ACOS((XOFF(I)-XON(NXHI1))/R)
      THETAP = THETA + 0.570796*(XOFF(I)-XON(1))/(XON(NXHI1)-XON(1))
      AROFF(I) = 2.0 *(PI-THETAP)*R
  150 CONTINUE
      GO TO 110
  145 IF(YOFF(I).LT.Y4) GO TO 170
      R = SQRT((XOFF(I)-XON(NXHI3))**2+(YOFF(I)-YHI2)**2)
```

```
      THETA = ACOS((XOFF(I)-XON(NXHI3))/R)
      THETAP = THETA + 0.570796*(XOFF(I)-XON(NT))/(XON(NXHI3)-XON(NT))
      AROFF(I) = 2.0 *(PI-THETAP)*R
      IRAK(K1) = 7
  160 CONTINUE
      GO TO 110
  170 IF(XOFF(I).GT.XHI2) GO TO 180
      IRAK(K1)= 3
      AROFF(I) = Y3-Y2
  175 CONTINUE
      GO TO 110
  180 IF(YOFF(I).LT.Y5) GO TO 190
      IRAK(K1) = 4
      NS7 = NH
      CALL INTER(XON,YON,NXHI2,NS7,XOFF(I),Y6)
      AROFF(I) = Y3-Y6
      CALL INTER(XON,AR,NXHI2,NH,XOFF(I),Y)
      IF(XOFF(I).LT.XON(NXHI3)) AROFF(I)=Y
  185 CONTINUE
      GO TO 110
  190 AROFF(I) = Y5-Y2
  195 CONTINUE
      IRAK(K1) = 5
      GO TO 110
  200 IRAK(K1) = 1
      AROFF(I) = AR(NXHI1)
  205 CONTINUE
  110 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE ANGLEF
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               FLND,ANG(700),AR(700),AROFF(200)
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2               IHUB
C ---------------------------------------------------------------------
C
C  THIS SUPPOUTINE CALCULATES THE ANGLE OF THF BODY SURFACE
C
      NS = NS1-1
      DO 10 I = 1,NS
      ANG(I) = ATAN((YON(I+1)-YON(I))/(XON(I+1)-XON(I)))
   10 CONTINUE
      NT2 = NH-1
      IF(IHUB.EQ.0) GO TO 21
      N = NS1+1
      DO 20 I = N,NT2
      ANG(I) = ATAN((YON(I+1)-YON(I))/(XON(I+1)-XON(I)))
   20 CONTINUE
   21 N = NT2+2
      NT3 = NT-1
      DO 30 I =N,NT3
      ANG(I) = ATAN((YON(I+1)-YON(I))/(XON(I+1)-XON(I)))
   30 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE SURF
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               ELND,ANG(700),AR(700),AROFF(200)
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2               IHUB
C ---------------------------------------------------------------------
C
C  THIS SUBROUTINE CALCULATES THE SURFACE DISTANCE ON EACH BODY
C  FROM ITS HIGHLIGHT
C
      IF(YON(NXHI1).GT.YR1) GO TO 1;
      S(NXHI1)= -SQRT((XON(NXHI1)-XR1)**2+(YON(NXHI1)-YR1)**2)
      NN1 = NXHI1+2
```

```
      NN2 = NXHI1-1
      S(NN1-1)=  SQRT((XON(NN1-1)-XR1)**2+(YON(NN1-1)-YR1)**2)
      GO TO 20
   10 S(NXHI1) = SQRT((XON(NXHI1)-XR1)**2+(YON(NXHI1)-YR1)**2)
      NN1 = NXHI1+1
      NN2 = NXHI1-2
      S(NN2+1) =-SQRT((XON(NN2+1)-XR1)**2+(YON(NN2+1)-YR1)**2)
   20 DO 30 I = NN1,NS1
      S(I) = S(I-1)+SQRT((XON(I)-XON(I-1))**2+(YON(I)-YON(I-1))**2)
   30 CONTINUE
      DO 40 II = 1,NN2
      I = NN2+1-II
      S(I) = S(I+1)-SQRT((XON(I)-XON(I+1))**2+(YON(I)-YON(I+1))**2)
   40 CONTINUE
      IF(IHUB.EQ.0) GO TO 81
      IF(YON(NXHI2).GT.YRH) GO TO 50
      S(NXHI2) =-SQRT((XON(NXHI2)-XRH)**2+(YON(NXHI2)-YRH)**2)
      NN1 = NXHI2+2
      NN2 = NXHI2-1
      S(NN1-1) = SQRT((XON(NN1-1)-XRH)**2+(YON(NN1-1)-YRH)**2)
      GO TO 60
   50 S(NXHI2) = SQRT((XON(NXHI2)-XRH)**2+(YON(NXHI2)-YRH)**2)
      NN1 = NXHI2+1
      NN2 = NXHI2-2
      S(NN2+1) =-SQRT((XON(NN2+1)-XRH)**2+(YON(NN2+1)-YRH)**2)
   60 IS = NS1+1
      IS2 = NH
      DO 70 I = NN1,IS2
      S(I) = S(I-1)+SQRT((XON(I)-XON(I-1))**2+(YON(I)-YON(I-1))**2)
   70 CONTINUE
      DO 80 II = IS,NN2
      I = NN2+IS-II
      S(I) = S(I+1)-SQRT((XON(I)-XON(I+1))**2+(YON(I)-YON(I+1))**2)
   80 CONTINUE
   81 IF(YON(NXHI3).LE.YR2) GO TO 90
      S(NXHI3) =-SQRT((XON(NXHI3)-XR2)**2+(YON(NXHI3)-YR2)**2)
      NN1 = NXHI3+1
      NN2 = NXHI3-2
      S(NN2+1) = SQRT((XON(NN2+1)-XR2)**2+(YON(NN2+1)-YR2)**2)
      GO TO 100
   90 S(NXHI3) = SQRT((XON(NXHI3)-XR2)**2+(YON(NXHI3)-YR2)**2)
      NN1 = NXHI3+2
      NN2 = NXHI3-1
      S(NN1-1) =-SQRT((XON(NN1-1)-XR2)**2+(YON(NN1-1)-YR2)**2)
  100 IS = NH+1
      DO 110 I=NN1,NT
      S(I) = S(I-1)-SQRT((XON(I)-XON(I-1))**2+(YON(I)-YON(I-1))**2)
  110 CONTINUE
      DO 120 II = IS,NN2
      I = NN2+IS-II
      S(I) = S(I+1)+SQRT((XON(I)-XON(I+1))**2+(YON(I)-YON(I+1))**2)
  120 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE SOLVE
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               ELND,ANG(700),AR(700),AROFF(200)
      COMMON /VELOC/ V1(700),V2(700),V3(700),V4(700),V5(700),V1X(200),
     1               V2X(200),V3X(200),V4X(200),V5X(200),V1Y(200),
     2               V2Y(200),V3Y(200),V4Y(200),V5Y(200)
      COMMON /CONT/ VC,VS1,VS2,XMC,XMC1,XMC2,WDOTC,WDOTC1,WDOTC2,
     1               TITLE(3),VINF,ALFA,A,B,C,D,A1C,A2C,A3C,A4C,A5C,A11,
     2               A21,A31,A41,A51,A12,A22,A32,A42,A52,VIC,VIC1,VIC2
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2               IHUB
      COMMON /CONDIT/ TTOTAL,PT,PSTAT,TSTAT,PSTATC,ATOTAL,PTC,RHOST,
     1               RHOTOT,ASTAT,QCINF
      COMMON /WRIT/  AA1C,AA2C,AA3C,AA4C,AA5C,AA11,AA21,AA31,AA41,AA51,
     1               AA12,AA22,AA32,AA42,AA52
      COMMON /SOLUT/ VBAR(700),VBARO(200),VINC(700),VXINC(200),
     1               VYINC(200),RHOB(700),RBORT(700),RHOBO(200),
     2               VCOM(700),RBOOT(200),VRE(200),VRECOM(200),
     3               VXCOM(200),VYCOM(200),THETA(200),PSOPTC(700),
     4               PSOPT(700),CMACH(700),XMACH(700),CPI(700),CPC(700),
     5               RHOI(700)
C ------------------------------------------------------------------------
C
C  THIS SUBROUTINE SOLVES FOR THE COEFFICIENTS A,B,C, AND D AND
C  SOLVES FOR VBAR AND V INCOMPRESSIBLE FOR BOTH ON- AND OFF-BODY
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POINTS

```
      DIMENSION YNEW(50),VNEW1(50),VNEW2(50),VNEW3(50),VNEW4(50),
     1          VNEW5(50)
      G = 32.174
      IF(M1.EQ.1) GO TO 30
C THE FOLLOWING CALCULATIONS ARE FOR THE CONTROL STATION
C UPSTREAM OF THE HUB
      A = XTEST
      NPL = 0
      NHI = NH+1
      DO 5 I10=NXHI1,NS1
      IF((A.GE.XON(I10)).AND.(A.LT.XON(I10+1))) THEAL = ANG(I10)
    5 CONTINUE
      DO 6 I10=NH1,NXHI3
      IF((A.LE.XON(I10)).AND.(A.GT.XON(I10+1))) THEAH = ANG(I10)
    6 CONTINUE
      CALL INTER2(NXHI1,NS1,A,YL,V1L,V2L,V3L,V4L,V5L)
      CALL INTER2(NH1,NXHI3,A,YH,V1H,V2H,V3H,V4H,V5H)
      DO 10 II = 1,K
      IF(II.EQ.1) I=1
      IF(II.EQ.1) GO TO 12
      I=NPPR(II-1)+1
   12 IF(A.NE.XOFF(I)) GO TO 10
      IF(II.EQ.1) NPL = 1
      IF(II.EQ.1) NPH = NPPR(I)
      IF(II.EQ.1) J3 = NPPR(1)
      DO 15 J =2,K
      IF(II.EQ.J) NPL = I
      IF(II.EQ.J) NPH = NPPR(J)-NPPR(J-1)
      IF(II.EQ.J)  J3 = NPPR(J)
   15 CONTINUE
   10 CONTINUE
      IF(NPL.EQ.0) WRITE(6,1000)
      IF(NPL.EQ.0) STOP
      DO 20 JJ = NPL,J3
      YNEW(JJ+2-NPL)  = YOFF(JJ)
      VNEW1(JJ+2-NPL) = V1X(JJ)
      VNEW2(JJ+2-NPL) = V2X(JJ)
      VNEW3(JJ+2-NPL) = V3X(JJ)
      VNEW4(JJ+2-NPL) = V4X(JJ)
      IF(IHUB.NE.0) VNEW5(JJ+2-NPL) = V5X(JJ)
   20 CONTINUE
      YNEW(1) = YL
      VNEW1(1) = V1L*COS(THEAL)
      VNEW2(1) = V2L*COS(THEAL)
      VNEW3(1) = V3L*COS(THEAL)
      VNEW4(1) = V4L*COS(THEAL)
      IF(IHUB.NE.0) VNEW5(1) = V5L*COS(THEAL)
      YNEW(NPH+2) = YH
      VNEW1(NPH+2) = -V1H*COS(THEAH)
      VNEW2(NPH+2) = -V2H*COS(THEAH)
      VNEW3(NPH+2) = -V3H*COS(THEAH)
      VNEW4(NPH+2) = -V4H*COS(THEAH)
      IF(IHUB.NE.0) VNEW5(NPH+2) = -V5H*COS(THEAH)
      NPT = NPH+2
      CALL INTEG(VNEW1,YNEW,AA1C,NPT)
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      CALL INTEG(VNEW2,YNEW,AA2C,NPT)
      CALL INTEG(VNEW3,YNEW,AA3C,NPT)
      CALL INTEG(VNEW4,YNEW,AA4C,NPT)
      IF(IHUB.NE.0) CALL INTEG(VNEW5,YNEW,AA5C,NPT)
      A1C = AA1C/AROFF(NPL)
      A2C = AA2C/AROFF(NPL)
      A3C = AA3C/AROFF(NPL)
      A4C = AA4C/AROFF(NPL)
      IF(IHUB.NE.0) A5C = AA5C/AROFF(NPL)
      IF(IHUB.EQ.0) GO TO 215
C   THE FOLLOWING CALCULATIONS ARE FOR THE LOWER CONTROL STATION
   30 IF(M1.EQ.1) GO TO 40
      IF(M2.EQ.1) GO TO 70
   40 A = XTEST1
      NPL = 0
      NH1 = NS1+1
      CALL INTER2(NST3,NS1,A,YNEW(1),VNEW1(1),VNEW2(1),VNEW3(1),VNEW4(1)
     1            ,VNEW5(1))
      DO 41 I10=NST3,NS1
      IF((A.GE.XON(I10)).AND.(A.LT.XON(I10+1))) THEAL = ANG(I10)
   41 CONTINUE
      DO 42 I10=NH1,NXHI2
      IF((A.LE.XON(I10)).AND.(A.GT.XON(I10+1))) THEAH = ANG(I10)
   42 CONTINUE
      VNEW1(1) = VNEW1(1)*COS(THEAL)
      VNEW2(1) = VNEW2(1)*COS(THEAL)
      VNEW3(1) = VNEW3(1)*COS(THEAL)
      VNEW4(1) = VNEW4(1)*COS(THEAL)
      VNEW5(1) = VNEW5(1)*COS(THEAL)
      CALL INTER2(NH1,NXHI2,A,YH,V1H,V2H,V3H,V4H,V5H)
      DO 50 II = 1,K
      IF(II.EQ.1) I=1
      IF(II.EQ.1) GO TO 45
      I = NPPR(II-1)+1
   45 IF((A.NE.XOFF(I)).OR.(YOFF(I).GT.YCU1)) GO TO 50
      IF(II.EQ.1) NPL = 1
      IF(II.EQ.1) NPH = NPPR(1)
      IF(II.EQ.1)  J3 = NPPR(1)
      DO 46 J=2,K
      IF(II.EQ.J) NPL = NPPR(J-1)+1
      IF(II.EQ.J) NPH = NPPR(J)-NPPR(J-1)
      IF(II.EQ.J)  J3 = NPPR(J)
   46 CONTINUE
   50 CONTINUE
      IF(NPL.EQ.0) WRITE(6,1001)
      IF(NPL.EQ.0) STOP
      DO 60 JJ = NPL,J3
      YNEW(JJ+2-NPL) = YOFF(JJ)
      VNEW1(JJ+2-NPL) = V1X(JJ)
      VNEW2(JJ+2-NPL) = V2X(JJ)
      VNEW3(JJ+2-NPL) = V3X(JJ)
      VNEW4(JJ+2-NPL) = V4X(JJ)
      VNEW5(JJ+2-NPL) = V5X(JJ)
   60 CONTINUE
      YNEW(NPH+2) = YH
      VNEW1(NPH+2) = -V1H*COS(THEAH)
      VNEW2(NPH+2) = -V2H*COS(THEAH)
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      VNEW3(NPH+2) = -V3H*COS(THEAH)
      VNEW4(NPH+2) = -V4H*COS(THEAH)
      VNEW5(NPH+2) = -V5H*COS(THEAH)
      NPT=NPH+2
      CALL INTEG(VNEW1,YNEW,AA11,NPT)
      CALL INTEG(VNEW2,YNEW,AA21,NPT)
      CALL INTEG(VNEW3,YNEW,AA31,NPT)
      CALL INTEG(VNEW4,YNEW,AA41,NPT)
      CALL INTEG(VNEW5,YNEW,AA51,NPT)
      A11 = AA11/AROFF(NPL)
      A21 = AA21/AROFF(NPL)
      A31 = AA31/AROFF(NPL)
      A41 = AA41/AROFF(NPL)
      A51 = AA51/AROFF(NPL)
C  THE FOLLOWING CALCULATIONS ARE FOR THE UPPER CONTROL STATION
   70 IF((M1.EQ.0).AND.(M2.EQ.0)) GO TO 80
      A = XTEST2
      NPL = 0
      NH1 = NH+1
      NSH= NH
      CALL INTER2(NXHI2,NSH,A,YNEW(1),VNEW1(1),VNEW2(1),VNEW3(1),
     1            VNEW4(1),VNEW5(1))
      DO 71 I10 = NXHI2,NSH
      IF((A.GE.XON(I10)).AND.(A.LT.XON(I10+1))) THEAL = ANG(I10)
   71 CONTINUE
      DO 72 I10=NH1,NST7
      IF((A.LE.XON(I10)).AND.(A.GT.XON(I10+1))) THEAH = ANG(I10)
   72 CONTINUE
      VNEW1(1) = VNEW1(1)*COS(THEAL)
      VNEW2(1) = VNEW2(1)*COS(THEAL)
      VNEW3(1) = VNEW3(1)*COS(THEAL)
      VNEW4(1) = VNEW4(1)*COS(THEAL)
      VNEW5(1) = VNEW5(1)*COS(THEAL)
      DO 90 II = 1,K
      IF(II.EQ.1) I=1
      IF(II.EQ.1) GO TO 95
      I = NPPR(II-1)+1
   95 IF((A.NE.XOFF(I)).OR.(IRAK(II).NE.4)) GO TO 90
      IF(II.EQ.1) NPL=1
      IF(II.EQ.1) NPH = NPPR(1)
      IF(II.EQ.1)  J3 = NPPR(1)
      DO 96 J=2,K
      IF(II.EQ.J) NPL=I
      IF(II.EQ.J) NPH = NPPR(J)-NPPR(J-1)
      IF(II.EQ.J)  J3 = NPPR(J)
   96 CONTINUE
   90 CONTINUE
      IF(NPL.EQ.0) WRITE(6,1002)
      IF(NPL.EQ.0) STOP
      NPT = NPH+2
      CALL INTER2(NH1,NST7,A,YNEW(NPT),VNEW1(NPT),VNEW2(NPT),VNEW3(NPT),
     1            VNEW4(NPT),VNEW5(NPT))
      VNEW1(NPT) = -VNEW1(NPT)*COS(THEAH)
      VNEW2(NPT) = -VNEW2(NPT)*COS(THEAH)
      VNEW3(NPT) = -VNEW3(NPT)*COS(THEAH)
      VNEW4(NPT) = -VNEW4(NPT)*COS(THEAH)
      VNEW5(NPT) = -VNEW5(NPT)*COS(THEAH)
```

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      DO 100 JJ = NPL,J3
      YNEW(JJ+2-NPL) = YOFF(JJ)
      VNEW1(JJ+2-NPL) = V1X(JJ)
      VNEW2(JJ+2-NPL) = V2X(JJ)
      VNEW3(JJ+2-NPL) = V3X(JJ)
      VNEW4(JJ+2-NPL) = V4X(JJ)
      VNEW5(JJ+2-NPL) = V5X(JJ)
  100 CONTINUE
      CALL INTEG(VNEW1,YNEW,AA12,NPT)
      CALL INTEG(VNEW2,YNEW,AA22,NPT)
      CALL INTEG(VNEW3,YNEW,AA32,NPT)
      CALL INTEG(VNEW4,YNEW,AA42,NPT)
      CALL INTEG(VNEW5,YNEW,AA52,NPT)
      A12 = AA12/AROFF(NPL)
      A22 = AA22/AROFF(NPL)
      A32 = AA32/AROFF(NPL)
      A42 = AA42/AROFF(NPL)
      A52 = AA52/AROFF(NPL)
   80 IF(M1.EQ.1) GO TO 200
      IF(M2.EQ.1) GO TO 210
C  THE FOLLOWING IS FOR THE CASE WHERE UPSTREAM AND LOWER
C  CONTROL STATIONS ARE INPUT
      VCL = A3C-A4C
      VL1= A31-A41
      VU1 = A51-A41
      VCU = A5C-A4C
      A = VINF*COS(ALFA)
      B = VINF*SIN(ALFA)
      D= (VS1*VCL-VC*VL1+(A*A1C+B*A2C)*VL1-(A*A11+B*A21)*VCL)/(VU1*VCL-
     1   VCU*VL1)
      C = (VS1-(A*A11+B*A21)-D*VU1)/VL1
      GO TO 220
C  THE FOLLOWING IS FOR THE CASE WHERE UPPER AND LOWER
C  CONTROL STATIONS ARE INPUT
  200 A = VINF*COS(ALFA)
      B = VINF*SIN(ALFA)
      VL2 = A32-A42
      VL1 = A31-A41
      VU1 = A51-A41
      VU2 = A52-A42
      D = (VS1*VL2-VS2*VL1+(A*A12+B*A22)*VL1-(A*A11+B*A21)*VL2)/(VU1*VL2
     1    -VU2*VL1)
      C = (VS1-(A*A11+B*A21)-D*VU1)/VL1
      GO TO 220
C  THE FOLLOWING IS FOR THE CASE WHERE UPSTREAM AND UPPER
C  CONTROL STATIONS ARE INPUT
  210 A = VINF*COS(ALFA)
      B = VINF*SIN(ALFA)
      VCL = A3C-A4C
      VL2 = A32-A42
      VU2 = A52-A42
      VCU = A5C-A4C
      D = (VS2*VCL-VC*VL2+(A*A1C+B*A2C)*VL2-(A*A12+B*A22)*VCL)/(VU2*VCL-
     1    VCU*VL2)
      C = (VS2-(A*A12+B*A22)-D*VU2)/VL2
      GO TO 220
  215 A = VINF*COS(ALFA)
```

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OF POOR QUALITY

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      B = VINF*SIN(ALFA)
      C = (VC-A*A1C-B*A2C)/(A3C-A4C)
C  THE FOLLOWING ARE THE CALCULATIONS FOR V AND VBAR
  220 DO 230 I=1,NT
      IF(IHUB.EQ.0) VINC(I)=A*V1(I)+B*V2(I)+C*(V3(I)-V4(I))
      IF(IHUB.EQ.0) GO TO 230
      VINC(I) = A*V1(I)+B*V2(I)+C*(V3(I)-V4(I))+D*(V5(I)-V4(I))
  230 CONTINUE
      DO 240 I =1,NP
      IF(IHUB.EQ.0) VXINC(I)=A*V1X(I)+B*V2X(I)+C*(V3X(I)-V4X(I))
      IF(IHUB.EQ.0) VYINC(I)=A*V1Y(I)+B*V2Y(I)+C*(V3Y(I)-V4Y(I))
      IF(IHUB.EQ.0) GO TO 235
      VXINC(I)= A*V1X(I)+B*V2X(I)+C*(V3X(I)-V4X(I))+D*(V5X(I)-V4X(I))
      VYINC(I)= A*V1Y(I)+B*V2Y(I)+C*(V3Y(I)-V4Y(I))+D*(V5Y(I)-V4Y(I))
  235 VRE(I) = SQRT(VXINC(I)**2+VYINC(I)**2)
      THETA(I) = ATAN(VYINC(I)/VXINC(I))/3.141592654*180.0
  240 CONTINUE
      DO 250 I = 1,NT
      VBAR(I)=WDOTC/RHOTOT/AR(I)*12.0/G
      IF(IHUB.EQ.0) GO TO 245
      IF((I.GT.NST3).AND.(I.LE.NXHI2)) VBAR(I) = WDOTC1/RHOTOT/
     1          AR(I)*12.0/G
      IF((I.GT.NXHI2).AND.(I.LE.NST7)) VBAR(I) = WDOTC2/RHOTOT/
     1          AR(I)*12.0/G
      XHI2=XON(NXHI2)
      IF((XHI2.LT.XON(NXHI3)).AND.(XON(I).LT.XON(NXHI3)).AND.(I.GT.NXHI2
     1   ).AND.(VBAR(I).LT.VINF)) VBAR(I)=VINF
      IF(XHI2.GT.XON(NXHI3)) GO TO 245
      IF(I.LT.NXHI2) VBAR(I)=WDOTC1/RHOTOT/AR(I)*12.0
     1      /G
  245 IF(((I.LT.NXHI1).OR.(I.GT.NXHI3)).AND.(VBAR(I).LT.VINF)) VBAR(I) =
     1      VINF
      IF(IHUB.EQ.0) XHI2=99999.
      IF((ABS(XON(NXHI1)-XON(NXHI3)).GT.0.01).AND.(XON(I).LT.XHI2).
     1   AND.(XON(I).LT.XON(NXHI3)).AND.(VBAR(I).LT.VINF)) VBAR(I)=VINF
  250 CONTINUE
      DO 260 I = 1,NP
      VBARO(I) = WDOTC/RHOTOT/AROFF(I)*12.0/G
      IF(I.LE.NPPR(1)) NCHK=1
      DO 255 J=2,K
      IF((I.LE.NPPR(J)).AND.(I.GT.NPPR(J-1))) NCHK = J
  255 CONTINUE
      IF(IRAK(NCHK).EQ.4) VBARO(I) = WDOTC2/RHOTOT/AROFF(I)*12.0/G
      IF(IRAK(NCHK).EQ.5) VBARO(I) = WDOTC1/RHOTOT/AROFF(I)*12.0/G
      IF((IRAK(NCHK).EQ.2).AND.(XHI2.LT.XON(NXHI3)))  VBARO(I)=WDOTC1/
     1    RHOTOT/AROFF(I)*12.0/G
      IF((IRAK(NCHK).EQ.1).AND.(XHI2.LT.XON(NXHI3)))  VBARO(I)=WDOTC1/
     1    RHOTOT/AROFF(I)*12.0/G
      IF(((IRAK(NCHK).EQ.1).OR.(IRAK(NCHK).EQ.2).OR.(IRAK(NCHK).EQ.6)
     1     .OR.(IRAK(NCHK).EQ.7)).AND.(VBARO(I).LT.VINF)) VBARO(I)=VINF
      IRT=NPPR(NCHK)
      IF((IRAK(NCHK).EQ.4).AND.(XOFF(IRT).LT.XON(NXHI3)).AND.(VBARO(I).
     1   LT.VINF)) VBARO(I) = VINF
  260 CONTINUE
 1000 FORMAT(///,10X,'THERE IS NO RAKE LOCATED AT THE DOWNSTREAM '
     1        'CONTROL STATION.  ',/,10X,'CHECK INPUT LOCATION OF '
     2        'CONTROL STATION.  RUN TERMINATED.')
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 1001 FORMAT(///,10X,'THERE IS NO RAKE LOCATED AT THE LOWER '
     1         'CONTROL STATION.  ',/,10X,'CHECK INPUT LOCATION OF '
     2         'CONTROL STATION.  RUN TERMINATED.')
 1002 FORMAT(///,10X,'THERE IS NO RAKE LOCATED AT THE UPPER '
     1         'CONTROL STATION.  ',/,10X,'CHECK INPUT LOCATION OF '
     2         'CONTROL STATION.  RUN TERMINATED.')
      STOP
      END
```

```
      SUBROUTINE COMCOR
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1              NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2                IHUB
      COMMON /CONDIT/ TTOTAL,PT,PSTAT,TSTAT,PSTATC,ATOTAL,PTC,RHOST,
     1               RHOTOT,ASTAT,OCINF
      COMMON /SOLUT/ VBAR(700),VBARO(200),VINC(700),VXINC(200),
     1               VYINC(200),RHOB(700),RBORT(700),RHOBO(200),
     2               VCOM(700),RBOOT(200),VRE(200),VRECOM(200),
     3               VXCOM(200),VYCOM(200),THETA(200),PSOPTC(700),
     4               PSOPT(700),CMACH(700),XMACH(700),CPI(700),CPC(700),
     5               RHOI(700)
C -----------------------------------------------------------------
C
C  THIS SUBROUTINE APPLIES THE COMPRESSIBLITY CORRECTION TO THE SOLUTION
C
      EXCON = 1.095*ATOTAL*125.0/216.0
      PI = 3.141592654
      PI180 = 180.0/PI
      VCHK = ATOTAL/SQRT(1.2)
      DO 10 I=1,NT
      A9 = 1.0
      CALL VBARIT(VBAR(I),ATOTAL,RHOTOT,RHOB(I))
      RBORT(I) = RHOB(I)/RHOTOT
      VCOM(I) = VINC(I)/RBORT(I)**(ABS(VINC(I)/VBAR(I)))
      VA = 0.2*(VCOM(I)/ATOTAL)**2
      IF(VA.GT.1.0) GO TO 25
      PSO = (1.0-0.2*(VCOM(I)/ATOTAL)**2)**3.5
      GO TO 30
   25 PSO = 0.0
   30 IF((ABS(VCOM(I)).LT.VCHK).OR.(ABS(NX).NE.1)) GO TO 10
      VSAVE = ABS(VCOM(I))
      IF((VSAVE/VCHK).GT.2.0) GO TO 10
      RHORTC = VSAVE*PSO**0.715/EXCON
      IF(RHORTC.EQ.0.0) RHORTC = 1.0
      IF(VCOM(I).LT.0.0) A9=-1.0
      VCOM(I) = VCHK*(1.0+(VSAVE/VCHK-1.0)**(1.0/RHORTC))*A9
   10 CONTINUE
      DO 20 I =1,NP
      CALL VBARIT(VBARO(I),ATOTAL,RHOTOT,RHOBO(I))
      RBOOT(I) = RHOBO(I)/RHOTOT
      VRECOM(I) = VRE(I)/RBOOT(I)**(VRE(I)/VBARO(I))
      VA = 0.2*(VRECOM(I)/ATOTAL)**2
      IF(VA.GT.1.0) GO TO 35
      PSI = (1.0-0.2*(VRECOM(I)/ATOTAL)**2)**3.5
      GO TO 40
   35 PSI = 0.0
   40 IF((VRECOM(I).LT.VCHK).OR.(ABS(NX).NE.1)) GO TO 15
      VSAVE = VRECOM(I)
      IF((VSAVE/VCHK).GT.2.0) GO TO 15
      RHORTC = VSAVE*PSI**0.715/EXCON
      IF(RHORTC.EQ.0.0) RHORTC =1.0
      VRECOM(I) = VCHK*(1.0+(VSAVE/VCHK-1.0)**(1.0/RHORTC))
   15 VXCOM(I) = VXINC(I)*VRECOM(I)/VRE(I)
      VYCOM(I) = VYINC(I)*VRECOM(I)/VRE(I)
      THETA(I) = ATAN(VYCOM(I)/VXCOM(I))*PI180
   20 CONTINUE
      RETURN
      END
```

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      SUBROUTINE ONBODY
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               ELND,ANG(700),AR(700),AROFF(200)
      COMMON /CONT/ VC,VS1,VS2,XMC,XMC1,XMC2,WDOTC,WDOTC1,WDOTC2,
     1             TITLE(3),VINF,ALFA,A,B,C,D,A1C,A2C,A3C,A4C,A5C,A11,
     2             A21,A31,A41,A51,A12,A22,A32,A42,A52,VIC,VIC1,VIC2
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2               IHUB
      COMMON /CONDIT/ TTOTAL,PT,PSTAT,TSTAT,PSTATC,ATOTAL,RTC,RHOST,
     1               RHOTOT,ASTAT,QCINF
      COMMON /SOLUT/ VBAR(700),VBARO(200),VINC(700),VXINC(200),
     1               VYINC(200),RHOB(700),RBORT(700),RHOBO(200),
     2               VCOM(700),RBOOT(200),VPE(200),VPECOM(200),
     3               VXCOM(200),VYCOM(200),THETA(200),PSOPTC(700),
     4               PSOPT(700),CMACH(700),XMACH(700),CPI(700),CPC(700),
     5               RHOI(700)
C ----------------------------------------------------------------------
C
C  THIS SUBROUTINE CALCULATES THE ON-BODY PROPERTIES
C
      DIMENSION DIMDUM(5)
      DO 10 I =1,NT
      VCONC = 0.2*(ABS(VCOM(I)/ATOTAL))**2
      VCON  = 0.2*(ABS(VINC(I)/ATOTAL))**2
      IF(VINF.EQ.0.0) CPI(I) = 9999.0
      IF(VINF.EQ.0.0) CPC(I) = 9999.0
      IF(VINF.EQ.0.0) GO TO 4
      CPI(I) = 1.0-(ABS(VINC(I)/VINF))**2
      CPC(I) = (PT-PSTAT-(0.5*RHOB(I)*VCOM(I)**2))/QCINF
    4 IF(VCONC.GT.1.0) PSOPTC(I) = 0.0
      IF(VCONC.GT.1.0) CMACH(I) = 999.0
      IF(VCON.GT.1.0) XMACH(I) = 999.0
      IF(VCON.GT.1.0) PSOPT(I) = 0.0
      IF(VCON.GT.1.0) RHOI(I) = 2000.0
      IF((VCONC.GT.1.0).AND.(VCON.GT.1.0)) GO TO 10
      IF(VCONC.GT.1.0) GO TO 5
      PSOPTC(I) = (1.0-VCONC)**3.5
      CMACH(I) = ABS(VCOM(I))/ATOTAL/SQRT(1.0-VCONC)
      IF(VCON.GT.1.0) GO TO 10
```

```
 5 PSOPT(I)  = (1.0-0.5*RHOTOT*VINC(I)**2/PT)
   XMACH(I) = ABS(VINC(I))/ATOTAL/SQRT(1.0-VCON )
10 CONTINUE
   WRITE(6,100)
   J=0
   DO 15 I=1,NS1
   IF(ICOMP.EQ.0) GO TO 11
   IF((CMACH(I).LT.1.0).OR.(ABS(NX).NE.1)) GO TO 12
   IF(CMACH(I-1).LT.1.0) WRITE(6,160) I
   IF(CMACH(I-1).LT.1.0) J = 3
   GO TO 12
11 IF((XMACH(I).LT.1.0).OR.(ABS(NX).NE.1)) GO TO 12
   IF(XMACH(I-1).LT.1.0) WRITE(6,160) I
   IF(XMACH(I-1).LT.1.0) J = 3
12 IF(ICOMP.EQ.0) GO TO 13
   IF((CMACH(I).LT.1.0).AND.(CMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
  1     WRITE(6,170) I
   IF((CMACH(I).LT.1.0).AND.(CMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
  1      J = J+2
   GO TO 15
13 IF((XMACH(I).LT.1.0).AND.(XMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
  1     WRITE(6,170) I
   IF((XMACH(I).LT.1.0).AND.(XMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
  1    J =J+2
15 CONTINUE
   IF(ICOMP.EQ.0) WRITE(6,105)
   IF(ICOMP.EQ.1) WRITE(6,106)
   DO 20 I = 1,NS1
   J=J+1
   IF(J.EQ.51) WRITE(6,95)
   IF((J.EQ.51).AND.(ICOMP.EQ.0)) WRITE(6,105)
   IF((J.EQ.51).AND.(ICOMP.EQ.1)) WRITE(6,106)
   IF(J.EQ.51) J=1
   IF(ICOMP.EQ.0) WRITE(6,110) I,XON(I),YON(I),S(I),VINC(I),XMACH(I),
  1                CPI(I),PSOPT(I)
   IF(ICOMP.EQ.1) WRITE(6,115) I,XON(I),YON(I),S(I),VCOM(I),VBAR(I),
  1                CMACH(I),CPC(I),RBORT(I),PSOPTC(I)
20 CONTINUE
   IF(IHUB.EQ.0) GO TO 26
   WRITE(6,120)
   IS = NS1+1
   IST = NH
   J=0
   DO 25 I=IS,IST
   IF(ICOMP.EQ.0) GO TO 21
   IF((CMACH(I).LT.1.0).OR.(ABS(NX).NE.1)) GO TO 22
   IF(CMACH(I-1).LT.1.0) WRITE(6,160) I
   IF(CMACH(I-1).LT.1.0) J = 3
   GO TO 22
21 IF((XMACH(I).LT.1.0).OR.(ABS(NX).NE.1)) GO TO 22
   IF(XMACH(I-1).LT.1.0) WRITE(6,160) I
   IF(XMACH(I-1).LT.1.0) J = 3
22 IF(ICOMP.EQ.0) GO TO 23
   IF((CMACH(I).LT.1.0).AND.(CMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
  1     WRITE(6,170) I
   IF((CMACH(I).LT.1.0).AND.(CMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
  1      J = J+2
```

```
      GO TO 25
   23 IF((XMACH(I).LT.1.0).AND.(XMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
     1     WRITE(6,170) I
      IF((XMACH(I).LT.1.0).AND.(XMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
     1    J =J+2
   25 CONTINUE
      IF(ICOMP.EQ.0) WRITE(6,105)
      IF(ICOMP.EQ.1) WRITE(6,106)
      DO 30 I = IS,IST
      J=J+1
      IF(J.EQ.51) WRITE(6,95)
      IF((J.EQ.51).AND.(ICOMP.EQ.0)) WRITE(6,105)
      IF((J.EQ.51).AND.(ICOMP.EQ.1)) WRITE(6,106)
      IF(J.EQ.51) J=1
      IF(ICOMP.EQ.0) WRITE(6,110) I,XON(I),YON(I),S(I),VINC(I),XMACH(I),
     1                CPI(I),PSOPT(I)
      IF(ICOMP.EQ.1) WRITE(6,115) I,XON(I),YON(I),S(I),VCOM(I),VBAR(I),
     1                CMACH(I),CPC(I),RBORT(I),PSOPTC(I)
   30 CONTINUE
   26 IS = NH+1
      WRITE(6,130)
      J=0
      DO 35 I=IS,NT
      IF(ICOMP.EQ.0) GO TO 31
      IF((CMACH(I).LT.1.0).OR.(ABS(NX).NE.1)) GO TO 32
      IF(CMACH(I-1).LT.1.0) WRITE(6,160) I
      IF(CMACH(I-1).LT.1.0) J = 3
      GO TO 32
   31 IF((XMACH(I).LT.1.0).OR.(ABS(NX).NE.1)) GO TO 32
      IF(XMACH(I-1).LT.1.0) WRITE(6,160) I
      IF(XMACH(I-1).LT.1.0) J = 3
   32 IF(ICOMP.EQ.0) GO TO 33
      IF((CMACH(I).LT.1.0).AND.(CMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
     1     WRITE(6,170) I
      IF((CMACH(I).LT.1.0).AND.(CMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
     1      J = J+2
      GO TO 35
   33 IF((XMACH(I).LT.1.0).AND.(XMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
     1     WRITE(6,170) I
      IF((XMACH(I).LT.1.0).AND.(XMACH(I-1).GE.1.0).AND.(ABS(NX).EQ.1))
     1    J =J+2
   35 CONTINUE
      IF(ICOMP.EQ.0) WRITE(6,105)
      IF(ICOMP.EQ.1) WRITE(6,106)
      DO 40 I=IS,NT
      J=J+1
      IF(J.EQ.51) WRITE(6,95)
      IF((J.EQ.51).AND.(ICOMP.EQ.0)) WRITE(6,105)
      IF((J.EQ.51).AND.(ICOMP.EQ.1)) WRITE(6,106)
      IF(J.EQ.51) J=1
      IF(ICOMP.EQ.0) WRITE(6,110) I,XON(I),YON(I),S(I),VINC(I),XMACH(I),
     1                CPI(I),PSOPT(I)
      IF(ICOMP.EQ.1) WRITE(6,115) I,XON(I),YON(I),S(I),VCOM(I),VBAR(I),
     1                CMACH(I),CPC(I),RBORT(I),PSOPTC(I)
   40 CONTINUE
C  THE FOLLOWING WRITES DATA TAPES FOR THE BOUNDARY LAYER PROGRAM
      ISTAG = 0
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      ISTAF =0
      REWIND 12
      REWIND 14
      DO 50 II = 1,NS1
      I = NS1+1-II
      IF(VINC(I).LT.0.0) GO TO 45
      IF((ISTAF.EQ.0).AND.(ICOMP.EQ.0)) WRITE(14,140) XON(I),YON(I),
     1          VINC(I),XMACH(I),PSOPT(I)
      IF((ISTAF.EQ.0).AND.(ICOMP.EQ.1)) WRITE(14,140) XON(I),YON(I),
     1          VCOM(I),CMACH(I),PSOPTC(I)
      IF(ISTAF.EQ.0) ISTAG=ISTAG+1
      GO TO 50
   45 IF((VINC(I)*VINC(I+1).LT.0.0).AND.(ICOMP.EQ.0).AND.(ISTAF.EQ.0))
     1          WRITE(14,140) XON(I),YON(I),VINC(I),XMACH(I),PSOPT(I)
      IF((VINC(I)*VINC(I+1).LT.0.0).AND.(ICOMP.EQ.1).AND.(ISTAF.EQ.0))
     1          WRITE(14,140) XON(I),YON(I),VCOM(I),CMACH(I),PSOPTC(I)
      ISTAF=1
   50 CONTINUE
      REWIND 14
      IF(ISTAF.EQ.1) ISTAG = ISTAG+1
      WRITE(12,150)  ISTAG
      DO 55 I=1,ISTAG
      READ(14,140) DIMDUM
      WRITE(12,140) DIMDUM
   55 CONTINUE
      ISTAG =0
      ISTAF =0
      NSTA = NH+1
      REWIND 12
      REWIND 13
      REWIND 14
      DO 60 I=NSTA,NT
      IF(VINC(I).GT.0.0) GO TO 56
      IF((ISTAF.EQ.0).AND.(ICOMP.EQ.0)) WRITE(14,140) XON(I),YON(I),
     1          VINC(I),XMACH(I),PSOPT(I)
      IF((ISTAF.EQ.0).AND.(ICOMP.EQ.1)) WRITE(14,140) XON(I),YON(I),
     1          VCOM(I),CMACH(I),PSOPTC(I)
      IF(ISTAF.EQ.0) ISTAG=ISTAG+1
      GO TO 60
   56 IF((VINC(I)*VINC(I-1).LT.0.0).AND.(ISTAF.EQ.0).AND.(ICOMP.EQ.0))
     1          WRITE(14,140) XON(I),YON(I),VINC(I),XMACH(I),PSOPT(I)
      IF((VINC(I)*VINC(I-1).LT.0.0).AND.(ISTAF.EQ.0).AND.(ICOMP.EQ.1))
     1          WRITE(14,140) XON(I),YON(I),VCOM(I),CMACH(I),PSOPTC(I)
      ISTAF=1
   60 CONTINUE
      REWIND 14
      IF(ISTAF.EQ.1) ISTAG=ISTAG+1
      WRITE(13,150) ISTAG
      DO 65 I=1,ISTAG
      READ(14,140) DIMDUM
      WRITE(13,140) DIMDUM
   65 CONTINUE
      REWIND 13
      RETURN
C *****FORMATS*****
   95 FORMAT(1H1)
  100 FORMAT(1H1,10X,'LOWER SHROUD',/,10X,'ON-BODY POINTS')
```

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105 FORMAT(/,2X,'I',7X,'X',11X,'Y',11X,'S',11X,'VINC',8X,'MACH',8X,
   1        'CP',6X,'PS/PT',/)
106 FORMAT(/,2X,'I',7X,'X',11X,'Y',11X,'S',11X,'VCOM',8X,'VBAR',8X,
   1        'MACH',8X,'CP',6X,'RB/RT',3X,'PS/PT',/)
110 FORMAT(I4,1P6E12.3,0PF8.4)
115 FORMAT(I4,1P7F12.3,0P2F8.4)
120 FORMAT(1H1,10X,'HUB',/,10X,'ON-BODY POINTS')
130 FORMAT(1H1,10X,'UPPER SHROUD',/,10X,'ON-BODY POINTS')
140 FORMAT(0P5F10.4)
150 FORMAT(I3)
160 FORMAT(/,2X,'ON-BODY SUPERSONIC VELOCITY CORRECTION START, '
   1        'I = ',I4,/)
170 FORMAT(2X,'SUPERSONIC VELOCITY CORRECTION STOP, I = ',I4,/)
    END
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      SUBROUTINE OFBDY
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               FLND,ANG(700),AR(700),AROFF(200)
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2               IHUB
      COMMON /CONDIT/ TTOTAL,PT,PSTAT,TSTAT,PSTATC,ATOTAL,PTC,RHOST,
     1               RHOTOT,ASTAT,QCINF
      COMMON /SOLUT/ VBAR(700),VBARO(200),VINC(700),VXINC(200),
     1               VYINC(200),RHOB(700),RBORT(700),RHOBO(200),
     2               VCOM(700),RBOOT(200),VRE(200),VRECOM(200),
     3               VXCOM(200),VYCOM(200),THETA(200),PSOPTC(700),
     4               PSOPT(700),CMACH(700),XMACH(700),CPI(700),CPC(700),
     5               RHOI(700)
      COMMON /SOLUTO/ PSOFPC(200),PSOFP(200),CMACO(200),XMACO(200),
     1                RHOOI(200)
      COMMON/PICT/VPERIN,XX,XMIN,EXEP,YY,YMIN,ORD,EMSTOP,AL,AAAA
C ---------------------------------------------------------------------
C
C  THIS SUBROUTINE CALCULATES OFF-BODY PROPERTIES
C
      DIMENSION WTOT(30),YINT(200),RV(200),WFRAC(200)
      WRITE(6,1)
      DO 10 I =1,NP
      VCONC = 0.2*(VRECOM(I)/ATOTAL)**2
      VCON  = 0.2*(VRE(I)/ATOTAL)**2
      IF(VCONC.GT.1.0) PSOFPC(I)  = 0.0
      IF(VCONC.GT.1.0) CMACO(I) = 999.0
      IF(VCON.GT.1.0) XMACO(I) = 999.0
```

```
      IF(VCON.GT.1.0) PSOFP(I) = 0.0
      IF(VCON.GT.1.0) RHOOI(I) = 2000.0
      IF((VCONC.GT.1.0).AND.(VCON.GT.1.0)) GO TO 10
      IF(VCONC.GT.1.0) GO TO 5
      PSOFPC(I) = (1.0-VCONC)**3.5
      CHACO(I) = VRECOM(I)/ATOTAL/SQRT(1.0-VCONC)
      IF(VCON.GT.1.0) GO TO 10
    5 PSOFP(I)  = (1.0-0.5*RHOTOT*VRE(I)**2/PT)
      XMACO(I) = VRE(I)/ATOTAL/SQRT(1.0-VCON )
   10 CONTINUE
      DO 50 I=1,K
      IF(I.EQ.1) NPH = NPPR(1)
      IF(I.EQ.1) NPL = 1
      IF(I.EQ.1) J3 = NPH
      II = NPPR(I-1)+1
   20 DO 30 J=2,K
      IF(I.NE.J) GO TO 30
      NPL = II
      NPH = NPPR(J)-NPPR(J-1)
      J3 = NPPR(J)
   30 CONTINUE
C
C  IRAK = 1    RAKE IS UPSTREAM OF BODY
C       = 2    RAKE IS ON LOWER EXTENDED LIP
C       = 3    RAKE IS COMPLETELY IN INLET UPSTREAM OF HUB
C       = 4    RAKE IS DOWNSTREAM OF AND ABOVE HUB
C       = 5    RAKE IS DOWNSTREAM OF AND BELOW HUB
C       = 6    RAKE IS OUTSIDE AND BELOW INLET
C       = 7    RAKE IS OUTSIDE AND ABOVE INLET
      THEAL = 0.0
      THEAH = 0.0
      IF(IRAK(I).EQ.1) GO TO 40
      IF(IRAK(I).EQ.2) GO TO 60
      IF(IRAK(I).EQ.3) GO TO 70
      IF(IRAK(I).EQ.4) GO TO 80
      IF(IRAK(I).EQ.5) GO TO 90
      IF(IRAK(I).EQ.6) GO TO 220
      IF(IRAK(I).EQ.7) GO TO 230
   40 WRITE(6,500) I
      IF(ICOMP.EQ.0) WRITE(6,521)
      IF(ICOMP.EQ.1) WRITE(6,522)
      DO 45 L = NPL,J3
      LL = L-NPL+1
      YINT(LL) =YOFF(L)
      IF(ICOMP.EQ.0) RV(LL) = VXINC(L)*RHOTOT
      RHO=(PSOFPC(L)**(1./1.4))
      IF(ICOMP.EQ.1) RV(LL) = VXCOM(L)*RHO*RHOTOT
   45 CONTINUE
      CALL INTEG(RV,YINT,WTOT(I),LL)
      L1 = NPL+1
      DO 46 L = L1,J3
      LL = L-NPL+1
      CALL INTEG(RV,YINT,W,LL)
      WFRAC(LL) = W/WTOT(I)
   46 CONTINUE
      WFRAC(1) = 0.0
      DO 100 N = NPL,J3
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      NW = N-NPL+1
      IF(ICOMP.EQ.0) WRITE(6,550) NW,XOFF(N),YOFF(N),VXINC(N),VYINC(N),
     1          VRE(N),THETA(N),XMACO(N),PSOFP(N),WFRAC(NW)
      IF(ICOMP.EQ.1) WRITE(6,560) NW,XOFF(N),YOFF(N),VXCOM(N),VYCOM(N),
     1 VRECOM(N),THETA(N),VBARO(N),CMACO(N),RBOOT(N),PSOFPC(N),WFRAC(NW)
  100 CONTINUE
      GO TO 50
   60 WRITE(6,500) I
      IF(ICOMP.EQ.0) WRITE(6,521)
      IF(ICOMP.EQ.1) WRITE(6,522)
      DO 110 I10 = NXHI1,NS1
      IF((XOFF(NPL).GE.XON(I10)).AND.(XOFF(NPL).LT.XON(I10+1))) THEAL =
     1          ANG(I10)
  110 CONTINUE
      CALL INTER3(XON,NXHI1,NS1,XOFF(NPL),YINT(1),VLC,VLI,ROC,VBL,
     1             CML,XML,PL,PIL)
      VLIX = VLI*COS(THEAL)
      VLIY = VLI*SIN(THEAL)
      VLCX = VLC*COS(THEAL)
      VLCY = VLC*SIN(THEAL)
      THEAL = THEAL*180.0/3.141592654
      IF(ICOMP.EQ.0) RV(1) = VLIX*RHOTOT
      IF(ICOMP.EQ.1) RV(1) = VLCX*PL**(1./1.4)*RHOTOT
      DO 120 L = NPL,J3
      NW = L-NPL+2
      YINT(NW) = YOFF(L)
      IF(ICOMP.EQ.0) RV(NW) = VXINC(L)*RHOTOT
      RHO=(PSOFPC(L)**(1./1.4))
      IF(ICOMP.EQ.1) RV(NW) = RHO*VXCOM(L)*RHOTOT
  120 CONTINUE
  121 X3 = 0.0
      CALL INTEG(RV,YINT,WTOT(I),NW)
      IF(ICOMP.EQ.0) WRITE(6,530) XOFF(NPL),YINT(1),VLIX,VLIY,VLI,THEAL,
     1          XML,PIL,X3
      IF(ICOMP.EQ.1) WRITE(6,540) XOFF(NPL),YINT(1),VLCX,VLCY,VLC,THEAL,
     1          VBL,CML,ROC,PL,X3
      DO 130 L=NPL,J3
      LL = L-NPL+2
      CALL INTEG(RV,YINT,W,LL)
      L1 = L-NPL+1
      WFRAC(L1) = W/WTOT(I)
      IF(ICOMP.EQ.0) WRITE(6,550) L1,XOFF(L),YOFF(L),VXINC(L),VYINC(L),
     1          VRE(L),THETA(L),XMACO(L),PSOFP(L),WFRAC(L1)
      IF(ICOMP.EQ.1) WRITE(6,560) L1,XOFF(L),YOFF(L),VXCOM(L),VYCOM(L),
     1     VRECOM(L),THETA(L),VBARO(L),CMACO(L),RBOOT(L),PSOFPC(L),
     2     WFRAC(L1)
  130 CONTINUE
      GO TO 50
   70 DO 140 I10 = NXHI1,NS1
      IF((XOFF(NPL).GE.XON(I10)).AND.(XOFF(NPL).LT.XON(I10+1))) THEAL =
     1          ANG(I10)
  140 CONTINUE
      NNS = NH+1
      DO 150 I10 = NNS,NXHI3
      IF((XOFF(NPL).LE.XON(I10)).AND.(XOFF(NPL).GT.XON(I10+1))) THEAH =
     1          ANG(I10)
  150 CONTINUE
```

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      NH1 = NPH+2
      CALL INTER3(XON,NXHI1,NS1,XOFF(NPL),YINT(1),VLC,VLI,ROC,VBL,
     1            CML,XML,PL,PIL)
      CALL INTER3(XON,NNS,NXHI3,XOFF(NPL),YINT(NH1),VUC,VUI,ROCU,
     1            VBU,CMU,XMUI,PU,PIU)
  160 VUC = -VUC
      VUI = -VUI
      VLIX = VLI*COS(THEAL)
      VLIY = VLI*SIN(THEAL)
      VLCX = VLC*COS(THEAL)
      VLCY = VLC*SIN(THEAL)
      VUIX = VUI*COS(THEAH)
      VUIY = VUI*SIN(THEAH)
      VUCX = VUC*COS(THEAH)
      VUCY = VUC*SIN(THEAH)
      THEAL = THEAL*180.0/3.141592654
      THEAH = THEAH*180.0/3.141592654
      WRITE(6,500) I
      IF(ICOMP.EQ.0) WRITE(6,521)
      IF(ICOMP.EQ.1) WRITE(6,522)
      IF(ICOMP.EQ.1)RV(1) = VLCX*PL**(1./1.4)*RHOTOT
      IF(ICOMP.EQ.0)RV(1) = VLIX*RHOTOT
      IF(ICOMP.EQ.0)RV(NH1) = VUIX*RHOTOT
      IF(ICOMP.EQ.1)RV(NH1) = VUCX*PU**(1./1.4)*RHOTOT
      DO 165 L = NPL,J3
      LL = L-NPL+2
      IF(ICOMP.EQ.0) RV(LL) = VXINC(L)*RHOTOT
      YINT(LL) =YOFF(L)
      RHO=(PSOFPC(L)**(1./1.4))
      IF(ICOMP.EQ.1) RV(LL) = VXCOM(L)*RHO*RHOTOT
  165 CONTINUE
      NW=LL
      IRT=NPPR(I)
      IF((IRAK(I).EQ.4).AND.(XOFF(IRT).LT.XON(NXHI3))) GO TO 121
      X3=0.0
      CALL INTEG(RV,YINT,WTOT(I),NH1)
      IF(ICOMP.EQ.0) WRITE(6,530) XOFF(NPL),YINT(1),VLIX,VLIY,VLI,THEAL,
     1               XML,PIL,X3
      IF(ICOMP.EQ.1) WRITE(6,540) XOFF(NPL),YINT(1),VLCX,VLCY,VLC,THEAL,
     1               VBL,CML,ROC,PL,X3
      DO 170 L = NPL,J3
      LL = L-NPL+2
      CALL INTEG(RV,YINT,W,LL)
      L1 = L-NPL+1
      WFRAC(L1) = W/WTOT(I)
      IF(ICOMP.EQ.0) WRITE(6,550) L1,XOFF(L),YOFF(L),VXINC(L),VYINC(L),
     1    VRE(L),THETA(L),XMACO(L),PSOFP(L),WFRAC(L1)
      IF(ICOMP.EQ.1) WRITE(6,560) L1,XOFF(L),YOFF(L),VXCOM(L),VYCOM(L),
     1    VRECOM(L),THETA(L),VBARO(L),CMACO(L),RBOOT(L),PSOFPC(L),
     2    WFRAC(L1)
  170 CONTINUE
      L1=L1+1
      WFRAC(L1) =1.0
      IF(ICOMP.EQ.0) WRITE(6,530) XOFF(NPL),YINT(NH1),VUIX,VUIY,VUI,
     1               THEAH,XMUI,PIU,WFRAC(L1)
      IF(ICOMP.EQ.1) WRITE(6,540) XOFF(NPL),YINT(NH1),VUCX,VUCY,VUC,
     1               THEAH,VBU,CMU,ROCU,PU,WFRAC(L1)
```

```
      GO TO 50
   80 NT1 = NH
      DO 180 I10 = NXHI2,NT1
      IF((XOFF(NPL).GE.XON(I10)).AND.(XOFF(NPL).LT.XON(I10+1))) THEAL =
     1          ANG(I10)
  180 CONTINUE
      NNN = NH+1
      DO 190 I10 = NNN,NXHI3
      IF((XOFF(NPL).LE.XON(I10)).AND.(XOFF(NPL).GT.XON(I10+1))) THEAH =
     1          ANG(I10)
  190 CONTINUE
      NH1 = NPH+2
      CALL INTER3(XON,NXHI2,NT1,XOFF(NPL),YINT(1),VLC,VLI,ROC,VBL,
     1               CML,XML,PL,PIL)
      CALL INTER3(XON,NNN,NXHI3,XOFF(NPL),YINT(NH1),VUC,VUI,ROCU,
     1               VBU,CMU,XMUI,PU,PIU)
      GO TO 160
   90 DO 200 I10 =NXHI1,NS1
      IF((XOFF(NPL).GE.XON(I10)).AND.(XOFF(NPL).LT.XON(I10+1))) THEAL =
     1          ANG(I10)
  200 CONTINUE
      NNN = NS1+1
      DO 210 I10 = NNN,NXHI2
      IF((XOFF(NPL).LE.XON(I10)).AND.(XOFF(NPL).GT.XON(I10+1))) THEAH =
     1          ANG(I10)
  210 CONTINUE
      NH1 = NPH+2
      CALL INTER3(XON,NXHI1,NS1,XOFF(NPL),YINT(1),VLC,VLI,ROC,VBL,
     1               CML,XML,PL,PIL)
      CALL INTER3(XON,NNN,NXHI2,XOFF(NPL),YINT(NH1),VUC,VUI,ROCU,
     1               VBU,CMU,XMUI,PU,PIU)
      GO TO 160
  220 DO 221 I10 = 1,NXHI1
      IF((XOFF(NPL).LE.XON(I10)).AND.(XOFF(NPL).GT.XON(I10+1))) THEAH =
     1          ANG(I10)
  221 CONTINUE
      WRITE(6,500) I
      IF(ICOMP.EQ.0) WRITE(6,521)
      IF(ICOMP.EQ.1) WRITE(6,522)
      NH1 = NPH+1
      CALL INTER3(XON,1,  NXHI1,XOFF(NPL),YINT(NH1),VUC,VUI,ROCU,
     1               VBU,CMU,XMUI,PU,PIU)
      IF(ICOMP.EQ.0) RV(NH1) = -VUI*COS(THEAH)*RHOTOT
      IF(ICOMP.EQ.1) RV(NH1) = -VUC*COS(THEAH)*PU**(1./1.4)*RHOTOT
      VUIX = -VUI*COS(THEAH)
      VUIY = -VUI*SIN(THEAH)
      VUCX = -VUC*COS(THEAH)
      VUCY = -VUC*SIN(THEAH)
      VUI = -VUI
      VUC = -VUC
      THEAH = THEAH*180.0/3.141592654
      DO 222 JJ = NPL,J3
      J1 =  JJ-NPL +1
      IF(ICOMP.EQ.0) RV(J1) = VXINC(JJ)*RHOTOT
      RHO=(PSOFPC(JJ)**(1./1.4))
      IF(ICOMP.EQ.1) RV(J1) = RHO*VXCOM(JJ)*RHOTOT
      YINT(J1) = YOFF(JJ)
```

```
 222 CONTINUE
     CALL INTEG(RV,YINT,WTOT(I),NH1)
     DO 223 J = NPL,J3
     J1 = J-NPL+2
     CALL INTEG(RV,YINT,W,J1)
     WFRAC(J1) = W/WTOT(I)
     WFRAC(1) = 0.0
     J2 =J1-1
     IF(ICOMP.EQ.0) WRITE(6,550) J2,XOFF(J),YOFF(J),VXINC(J),VYINC(J),
    1       VRE(J),THETA(J),XMACO(J),PSOFP(J),WFRAC(J2)
     IF(ICOMP.EQ.1) WRITE(6,560) J2,XOFF(J),YOFF(J),VXCOM(J),VYCOM(J),
    1VRECOM(J),THETA(J),VBARO(J),CMACO(J),RBOOT(J),PSOFPC(J),WFRAC(J2)
 223 CONTINUE
     J2 =J2+1
     IF(ICOMP.EQ.0) WRITE(6,550) J2,XOFF(NPL),YINT(NH1),VUIX,VUIY,VUI,
    1       THEAH,XMUI,PIU,WFRAC(J2)
     IF(ICOMP.EQ.1) WRITE(6,560) J2,XOFF(NPL),YINT(NH1),VUCX,VUCY,VUC,
    1       THEAH,VBU,CMU,ROCU,PU,WFRAC(J2)
     GO TO 50
 230 WRITE(6,500) I
     IF(ICOMP.EQ.0) WRITE(6,521)
     IF(ICOMP.EQ.1) WRITE(6,522)
     DO 231 I10 = NXHI3,NT
     IF((XOFF(NPL).GE.XON(I10)).AND.(XOFF(NPL).LT.XON(I10+1))) THEAL =
    1       ANG(I10)
 231 CONTINUE
     NH1 = NPH+1
     CALL INTER3(XON,NXHI3,NT ,XOFF(NPL),YINT(1),VLC,VLI,ROC,VBL,
    1            CML,XML,PL,PIL)
     VLIX = VLI*COS(THEAL)
     VLIY = VLI*SIN(THEAL)
     VLCX = VLC*COS(THEAL)
     VLCY = VLC*SIN(THEAL)
     THEAL = THEAL*180.0/3.141592654
     IF(ICOMP.EQ.0) RV(1) = VLIX*RHOTOT
     IF(ICOMP.EQ.1) RV(1) = VLCX*PL**(1./1.4)*RHOTOT
     DO 232 J = NPL,J3
     J1 = J-NPL+2
     IF(ICOMP.EQ.0) RV(J1) = VXINC(J)*RHOTOT
     RHO=(PSOFPC(J)**(1./1.4))
     IF(ICOMP.EQ.1) RV(J1) = RHO*VXCOM(J)*RHOTOT
     YINT(J1) = YOFF(J)
 232 CONTINUE
     CALL INTEG(RV,YINT,WTOT(I),NH1)
     WFRAC(1) = 0.0
     IF(ICOMP.EQ.0) WRITE(6,530) XOFF(NPL),YINT(1),VLIX,VLIY,VLI,THEAL,
    1          XML,PIL,WFRAC(1)
     IF(ICOMP.EQ.1) WRITE(6,540) XOFF(NPL),YINT(1),VLCX,VLCY,VLC,THEAL,
    1          VBL,CML,ROC,PL,WFRAC(1)
     DO 233 J = NPL,J3
     J1 = J-NPL+2
     CALL INTEG(RV,YINT,W,J1)
     WFRAC(J1) = W/WTOT(I)
     J2 = J1-1
     IF(ICOMP.EQ.0) WRITE(6,550) J2,XOFF(J),YOFF(J),VXINC(J),VYINC(J),
    1 VRE(J),THETA(J),XMACO(J),PSOFP(J),WFRAC(J1)
     IF(ICOMP.EQ.1) WRITE(6,560) J2,XOFF(J),YOFF(J),VXCOM(J),VYCOM(J),
```

```
     1 VRECOM(J),THETA(J),VBARO(J),CMACO(J),RBOOT(J),PSOFPC(J),WFRAC(J1)
  233 CONTINUE
   50 CONTINUE
C  THE FOLLOWING CALCULATES INTEGRATED RAKE WEIGHT FLOW DATA
      WRITE(6,570)
      DO 240 I=1,K
      WTOT(I) = WTOT(I)*32.174/12.0
      IF(I.EQ.1) NPL = 1
      IF(I.NE.1) NPL = NPPR(I-1) + 1
      I9 = NPPR(I)
      IF(IRAK(I).EQ.1) AREA = YOFF(I9)-YOFF(NPL)
      IF(IRAK(I).EQ.2) CALL INTER(XON,YON,NXHI1,NST3,XOFF(NPL),YL)
      IF(IRAK(I).EQ.2) AREA = YOFF(I9)-YL
      IF((IRAK(I).EQ.3).OR.(IRAK(I).EQ.4).OR.(IRAK(I).EQ.5)) AREA =
     1           AROFF(NPL)
      IF(IRAK(I).EQ.4) CALL INTER(XON,YON,NXHI2,NH,XOFF(NPL),Y)
      IF((IRAK(I).EQ.4).AND.(XOFF(I9).LT.XON(NXHI3))) AREA=YOFF(I9)-Y
      IF(IRAK(I).EQ.6) CALL INTER(XON,YON,1, . NXHI1,XOFF(NPL),YH)
      IF(IRAK(I).EQ.6) AREA = YH-YOFF(NPL)
      IF(IRAK(I).EQ.7) CALL INTER(XON,YON,NXHI3,NT,  XOFF(NPL),YL)
      IF(IRAK(I).EQ.7) AREA = YOFF(I9)-YL
      WDOTCA = WTOT(I)/AREA*12.0*SQRT(TTOTAL/518.67)/PTC*2116.23
      EM=0.0
  235 EF = 85.3848*EM/(1.0+0.2*EM*EM)**3.0-WDOTCA
      DFDM = 85.3848/(1.0+0.2*EM*EM)**3.0*(1.0-1.2*EM*EM/(1.0+0.2*EM*EM)
     1      )
      EM = EM-EF/DFDM
      IF(ABS(EF/DFDM/(EM+EF/DFDM)).GT.0.01) GO TO 235
      WRITE(6,580) I,XOFF(NPL),IRAK(I),WTOT(I),WDOTCA,EM
      IF(XOFF(NPL).EQ.XTEST) EMSTOR=EM
  240 CONTINUE
      RETURN
C *****FORMATS*****
    1 FORMAT(1H1)
  500 FORMAT(////,10X,'RAKE NUMBER ',I2)
  521 FORMAT(/,2X,'I',6X,'X',10X,'Y',9X,'VX',9X,'VY',9X,'VRE',7X,'THETA'
     1         ,6X,'MACH',6X,'PS/PT',4X,'WFRACT',/)
  522 FORMAT(/,2X,'I',6X,'X',10X,'Y',9X,'VX',9X,'VY',9X,'VRE',7X,'THETA'
     1         ,7X,'VBL',7X,'MACH',6X,'RB/RT',3X,'PS/PT',4X,'WFRACT',/)
  530 FORMAT(4X,1P7E11.3,0PF8.4,1PE11.3)
  540 FORMAT(4X,1P8E11.3,0P2F8.4,1PE11.3)
  550 FORMAT(I4,1P7E11.3,0PF8.4,1PE11.3)
  560 FORMAT(I4,1P8E11.3,0P2F8.4,1PE11.3)
  570 FORMAT(///,10X,'RAKE WEIGHT FLOW DATA',//,3X,'I',8X,'X',4X,'IRAK',
     1         4X,'WDOT',10X,'WDOTCA',8X,'MACH',/)
  580 FORMAT(I4,5X,0PF8.4,I4,1P3E14.5)
      END
```

```
      SUBROUTINE VBARIT(VBAR,ATOTAL,RHOTOT,RHOBAR)
C
C  THIS SUBROUTINE ITERATIVELY CALCULATES RHOBAR
C
      VCRIT = ATOTAL/SQRT(1.2)
      I=0
      VGUES = VBAR
   10 VGUESA = (VGUES/ATOTAL)**2
      A = 1.0-0.2*VGUESA
      B = A -VGUESA
      VCOMP = (VBAR-A**2.5*VGUES)/(A**1.5*B)+VGUES
      IF(ABS((VCOMP-VGUES)/VCOMP).LT.0.0001) GO TO 15
      I =I+1
      IF(VCOMP.GE.VCRIT) VCOMP = 0.5*(VGUES + VCRIT)
      VGUES = VCOMP
      IF(I.GT.20) GO TO 15
      GO TO 10
   15 RHOBAR = (1.0-0.2*(VCOMP/ATOTAL)**2)**2.5*RHOTOT
      IF(I.GT.20) WRITE(6,20) VBAR,VCOMP,RHOBAR
      IF(I.GT.20) VBAR = VCOMP*RHOBAR/RHOTOT
      RETURN
C *****FORMATS*****
   20 FORMAT(1H0,'I EXCEEDS 20 ITERATIONS FOR RHOBAR',5X,'VBAR = ',
     1       1PE10.3,2X,'VCOMP = ',1PE10.3,2X,'RHOBAR = ',1PE10.3,/,
     2       ' VBAR HAS BEEN REDUCED TO VCOMP*RHOBAR/RHOTOT, WHERE '
     3       'VCOMP = VCRITICAL')
      END
```

```
      SUBROUTINE INTEP(A,B,N1,N2,C,D)
C
C  THIS SUBROUTINE INTERPOLATES ARRAY "A" FOR THE VALUE "C" .
C  AND RETURNS IN "D" THE CORRESPONDING VALUE FROM "B".
C
      DIMENSION X(700),Y(700),A(1),B(1)
      N = N2-N1+1
      DO 10 I=1,N
      X(I)=A(N1+I-1)
      Y(I)=B(N1+I-1)
   10 CONTINUE
      CALL SORTXY(X,Y,N)
      DO 15 I=1,N
      K=I
      IF(C-X(I)) 25,20,15
   15 CONTINUE
   20 D = Y(K)
      GO TO 30
   25 IF(K.EQ.1) GO TO 35
      IF(K.EQ.N) K=N-1
      IF(X(K).EQ.X(K+1)) K=K-1
      W1 = (C-X(K))*(C-X(K+1))/(X(K-1)-X(K))/(X(K-1)-X(K+1))
      W2 = (C-X(K-1))*(C-X(K+1))/(X(K)-X(K-1))/(X(K)-X(K+1))
      W3 = (C-X(K-1))*(C-X(K))/(X(K+1)-X(K-1))/(X(K+1)-X(K))
      D = Y(K-1)*W1+Y(K)*W2+Y(K+1)*W3
   30 RETURN
   35 D = Y(1)
      RETURN
      END
```

```
      SUBROUTINE SORTXY(X,Y,NPTS)
C
C  THIS SUBROUTINE SORTS "X" INTO ASCENDING ORDER
C
      DIMENSION X(300),Y(300)
      N = NPTS
      NN = N-1
      DO 15 KT = 1,NN
      XMIN = X(KT)
      JAD = KT
      JKL = KT+1
      DO 20 JK = JKL,N
      IF(XMIN-X(JK)) 20,20,25
   25 XMIN = X(JK)
      JAD = JK
   20 CONTINUE
      YMIN = Y(JAD)
      X(JAD) = X(KT)
      Y(JAD) = Y(KT)
      X(KT) = XMIN
      Y(KT) = YMIN
   15 CONTINUE
      RETURN
      END
```

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```
      SUBROUTINE INTER2(I1,I2,A,B,C,D,E,F,G)
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               ELND,ANG(700),AR(700),AROFF(200)
      COMMON /VELOC/ V1(700),V2(700),V3(700),V4(700),V5(700),V1X(200),
     1               V2X(200),V3X(200),V4X(200),V5X(200),V1Y(200),
     2               V2Y(200),V3Y(200),V4Y(200),V5Y(200)
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2               IHUB
C -----------------------------------------------------------------------
      CALL INTER(XON,YON,I1,I2,A,B)
      CALL INTER(XON,V1,I1,I2,A,C)
      CALL INTER(XON,V2,I1,I2,A,D)
      CALL INTER(XON,V3,I1,I2,A,E)
      CALL INTER(XON,V4,I1,I2,A,F)
      IF(IHUB.NE.0) CALL INTER(XON,V5,I1,I2,A,G)
      IF(IHUB.EQ.0) G=0.0
      RETURN
      END
```

```
      SUBROUTINE INTER3(A,I1,I2,C,D,E,F,H,P,Q,R,S2,T)
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               ELND,ANG(700),AR(700),AROFF(200)
      COMMON /SOLUT/ VBAR(700),VBARO(200),VINC(700),VXINC(200),
     1               VYINC(200),RHOB(700),RBOPT(700),RHOBO(200),
     2               VCOM(700),RBOOT(200),VRE(200),VRECOM(200),
     3               VXCOM(200),VYCOM(200),THETA(200),PSOPTC(700),
     4               PSOPT(700),CMACH(700),XMACH(700),CPI(700),CPC(700),
     5               RHOI(700)
C ------------------------------------------------------------------------
      DIMENSION A(700)
      CALL INTER(A,YON,  I1,I2,C,D)
      CALL INTER(A,VCOM, I1,I2,C,E)
      CALL INTER(A,VINC, I1,I2,C,F)
      CALL INTER(A,RBORT,I1,I2,C,H)
      CALL INTER(A,VBAR, I1,I2,C,P)
      CALL INTER(A,CMACH,I1,I2,C,Q)
      CALL INTER(A,XMACH,I1,I2,C,R)
      CALL INTER(A,PSOPTC,I1,I2,C,S2)
      CALL INTER(A,PSOPT, I1,I2,C,T)
      RETURN
      END
```

```
      SUBROUTINE INTEG(B,A,C,I1)
C
C   THIS SUBROUTINE IS A TRAPEZOIDAL INTEGRATION ROUTINE
C
      DIMENSION A(700),B(700)
      SUM = 0.0
      DO 10 I=2,I1
      SUM =SUM+0.5*(B(I)+B(I-1))*(A(I)-A(I-1))
   10 CONTINUE
      C = SUM
      RETURN
      END
```

```
      SUBROUTINE CALTIT
      COMMON/VELOC/ V1(700),V2(700),V3(700),V4(700),V5(700),V1X(200),
     1              V2X(200),V3X(200),V4X(200),V5X(200),V1Y(200),
     2              V2Y(200),V3Y(200),V4Y(200),V5Y(200)
      COMMON/PICT/VPERIN,XX,XMIN,EXEP,YY,YMIN,OPD,EPSTOR,AL,AAAA
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               ELND,ANG(700),AR(700),AROFF(200)
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2               IHUB
      COMMON/SOLUT/ VBAR(700),VBARO(200),VINC(700),VXINC(200),
     1              VYINC(200),RHOB(700),RBORT(700),RHOBO(200),
     2              VCOM(700),RBOOT(200),VRE(200),VRECOM(200),
     3              VXCOM(200),VYCOM(200),THETA(200),PSOPTC(700),
     4              PSOPT(700),CMACH(700),XMACH(700),CPI(700),CPC(700),
     5              RHOI(700)
C
C ------------------------------------------------------------------------
C  THIS SUBROUTINE TITLES THE PLOTS OF PS/PT AND MACH NUMBER VS S
C
      DIMENSION BD(2),BD1(1),BD2(2),BT(3),BT2(1),BTIT(1),X(30),Y(30),
     1          BT1(3)
      DATA AA,AB,AC,AD,AE/'ANGLE=','VINF =','MACH =','AT X =',
     1                    'SCALE='/
      DATA BD/'UPPER ','SHROUD'/
      DATA BD1/' HUB  '/
      DATA BD2/'LOWER ','SHROUD'/
      DATA BT/'INNER ','SURFAC','E
      DATA BT1/'OUTER ','SURFAC','E
      DATA BT2/'SREF ='/
      DATA BTIT/'S/SREF'/
      IF(IPL.EQ.13) GO TO 60
      IP = 0.0
      NS = 12
      HF = 0.25
      DO 10 I = 1,19
      X(I) = 0.0
   10 CONTINUE
      Y(1) = 1.0
      DO 20 I = 1,19,4
      X(I) = 10.0
      X(I+1) = 10.0
   20 CONTINUE
      K = 1
      DO 30 I=2,19,2
      K=K+1
      Y(I) = 1.0*K
      Y(I+1) = 1.0*K
```

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30  CONTINUE
    CALL PLOT(0.0,1.0,3)
    DO 40 I= 1,19,2
    CALL PLOT(X(I),Y(I),2)
    CALL PLOT(X(I+1),Y(I+1),3)
40  CONTINUE
    CALL PLOT(0.0,10.0,2)
    CALL PLOT(1.0,0.0,3)
    DO 50 I=1,19,2
    CALL PLOT(Y(I),X(I),2)
    CALL PLOT(Y(I+1),X(I+1),3)
50  CONTINUE
    CALL PLOT(10.0,0.0,2)
    CALL PLOT(0.0,0.0,3)
    A = 7.1
    B = 1.3
    IF(IPL.EQ.1) CALL SYMBOL(A,B,HE,BD2,TH,12)
    IF(IPL.EQ.2) CALL SYMBOL(A,B,HE,BD1,TH,6)
    IF(IPL.EQ.3) CALL SYMBOL(A,B,HE,BD, TH,12)
    IF(IPL.EQ.2) GO TO 55
    A=6.1
    B=8.3
    HE = 0.15
    CALL SYMBOL(A,B,HE,1,TH,-1)
    A=6.5
    B=8.2
    CALL SYMBOL(A,B,HE,23,TH,-1)
    A=6.8
    CALL SYMBOL(A,B,HE,PT,TH,18)
    A=6.1
    B=7.8
    CALL SYMBOL(A,B,HE,2,TH,-1)
    A=6.5
    B=7.7
    CALL SYMBOL(A,B,HE,23,TH,-1)
    A=6.8
    CALL SYMBOL(A,B,HE,PT1,TH,18)
55  A=7.1
    B=0.6
    HE=0.25
    CALL SYMBOL(A,B,HE,PT2,TH,6)
    A=8.4
    IF(IPL.EQ.1) CALL NUMBER(A,B,HE,CUTOF1,TH,3)
    IF(IPL.EQ.2) CALL NUMBER(A,B,HE,CUTOFH,TH,3)
    IF(IPL.EQ.3) CALL NUMBER(A,B,HE,CUTOF2,TH,3)
    A=4.65
    B=0.5
    HE=0.15
    CALL SYMBOL(A,B,HE,RTIT,TH,6)
    GO TO 100
60  XST=0.0
    YST=0.0
    YST1=YST
    CALL PLOT(XST,YST,3)
    IX=INT(XX)
    IY=INT(YY)
    CALL PLOT(XX,YST,2)
```

```
      DO 70 I=1,IY,2
      YST=YST+1.0
      CALL PLOT(XX,YST,3)
      CALL PLOT(0.0,YST,2)
      YST=YST+1.0
      IF(YST.GT.YY) GO TO 70
      CALL PLOT(0.0,YST,3)
      CALL PLOT(XX,YST,2)
   70 CONTINUE
      CALL PLOT(0.0,YST1,3)
      CALL PLOT(0.0,YY,2)
      DO 75 I=1,IX,2
      XST=XST+1.0
      CALL PLOT(XST,YY,3)
      CALL PLOT(XST,0.0,2)
      XST=XST+1.0
      IF(XST.GT.XX) GO TO 75
      CALL PLOT(XST,0.0,3)
      CALL PLOT(XST,YY,2)
   75 CONTINUE
      CALL PLOT(0.0,YST1,3)
      PIO=3.141592654/180.0
      DO 80 I=1,NP
      IF(ICOMP.EQ.0) GO TO 76
      VX=VXCOM(I)
      VY=VYCOM(I)
      VRES=VRECOM(I)
      GO TO 77
   76 VX=VXINC(I)
      VY=VYINC(I)
      VRES=VRE(I)
   77 SIZE=VRES/VPERIN
      IF(VX.EQ.0) VX=.0000000001
      ANGLE=-SIGN(90.,VX)+ATAN(VY/VX)/PIO
      XP=(XOFF(I)-XMIN)/EXEP
      YP=(YOFF(I)-YMIN)/ORD
      IF(XP.GT.XX.OR.XP.LT.0.0.OR.YP.GT.YY.OR.YP.LT.0.0) GO TO 80
      SIZ=AMIN1(4./21.*SIZE,.15)
      SIZ2=SIZE-0.5*SIZ
      XHEAD=XP+VX/VPERIN/SIZE*SIZ2
      YHEAD=YP+VY/VPERIN/SIZE*SIZ2
      CALL SYMBOL(XP,YP,SIZ2,16,ANGLE,-1)
      CALL SYMBOL(XHEAD,YHEAD,SIZ,2,ANGLE,-1)
   80 CONTINUE
      CALL SYMBOL(XX+.15,4.,0.2,AA,0.,6)
      CALL NUMBER(XX+1.25,4.0,0.2,AL,0.,3)
      CALL SYMBOL(XX+.15,3.5,0.2,AB,0.,6)
      CALL NUMBER(XX+1.25,3.5,0.2,AAAA,0.,3)
      CALL SYMBOL(XX+.15,3.,0.2,AC,0.,6)
      CALL NUMBER(XX+1.25,3.0,0.2,EMSTOR,0.,3)
      CALL SYMBOL(XX+.15,2.7,0.2,AD,0.,6)
      CALL NUMBER(XX+1.25,2.7,0.2,XTEST,0.,3)
      CALL SYMBOL(XX+.15,2.2,0.2,AE,0.,6)
      CALL NUMBER(XX+1.25,2.2,0.2,VPERIN,0.,3)
  100 RETURN
      END
```

```
      SUBROUTINE PLTER(N1,N11,NHI,IS,K1)
      COMMON /CLPLOT/ XPEN,YPEN,NX6,NY,IPEN,XLABEL(10),YLABEL(10)
      COMMON /COORD/ XON(700),YON(700),XOFF(200),YOFF(200),S(700),
     1               S1(700),XTEST,XTEST1,XTEST2,YCL,YCU,YCL1,YCL2,YCU1,
     2               YCU2,XR1,XR2,XRH,YR1,YR2,YRH,CUTOF1,CUTOF2,CUTOFH,
     3               ELND,ANG(700),AR(700),AROFF(200)
      COMMON /CONT/ VC,VS1,VS2,XMC,XMC1,XMC2,WDOTC,WDOTC1,WDOTC2,
     1               TITLE(3),VINF,ALFA,A,B,C,D,A1C,A2C,A3C,A4C,A5C,A11,
     2               A21,A31,A41,A51,A12,A22,A32,A42,A52,VIC,VIC1,VIC2
      COMMON /COUT/ NT,NS1,NH,NP,IW,NX,KND,ICOMP,K,NXHI1,NXHI2,NXHI3,
     1               NST2,NST3,NST7,NPPR(30),IRAK(30),M1,M2,ICOMP1,IPL,
     2              IHUP
      COMMON /SOLUT/ VBAR(700),VBARO(200),VINC(700),VXINC(200),
     1               VYINC(200),RHOB(700),RBORT(700),RHOBO(200),
     2               VCOM(700),PBOOT(200),VRE(200),VRECOM(200),
     3               VXCOM(200),VYCOM(200),THETA(200),PSOPTC(700),
     4               PSOPT(700),CMACH(700),XMACH(700),CPI(700),CPC(700),
     5               RHOI(700)
C ---------------------------------------------------------------------
C
C  THIS SUBROUTINE PLOTS PS/PT AND MACH NUMBER VS S
C
      DIMENSION YD(4),YDD(3),XPLOT(500),YPLOT(500),KKK(7),P(14)
      KKK(1) = 4
      KKK(2) = 1
      KKK(3) = 2
      KKK(4) = 1
      KKK(5) = 1
      KKK(6) = N1
      KKK(7) = N11
      P(1) =3.0
      P(2) =10.0
      P(3) =0.0
      P(4) =1.0
      P(5) =10.0
      P(6) =0.0
      P(7) =1.0
      P(8) =10.0
      P(9) =0.0
      P(10)=0.0
      P(11)=0.0
      P(12)=0.0
      P(13)=0.0
      P(14)=90.0
      DATA YD(1),YD(2),YD(3),YD(4) / 'PRESSU','RE RAT','IO, PS','/PTC  '
     1          /
      DATA YDD(1),YDD(2),YDD(3)/ 'LOCAL ','MACH N','O.    '/
      DO 10 I=1,4
      YLABEL(I) = YD(I)
   10 CONTINUE
      XLABEL(1) = TITLE(1)
      XLABEL(2) = TITLE(2)
      XLABEL(3) = TITLE(3)
      XPEN = 0.0
      YPEN = 0.0
      IPEN =-3
      NX6 =-18
```

```
      NY=24
      IF(K1.EQ.2) GO TO 31
      DO 20 I=1,N1
      XPLOT(I) =S1(NHI+I-1)
      IF(ICOMP.EQ.0) YPLOT(I) = PSOPT(NHI+I-1)
      IF(ICOMP.EQ.1) YPLOT(I) = PSOPTC(NHI+I-1)
   20 CONTINUE
      DO 30 I=1,N11
      XPLOT(N1+I) = S1(IS+I-1)
      IF(ICOMP.EQ.0) YPLOT(N1+I) = PSOPT(IS+I-1)
      IF(ICOMP.EQ.1) YPLOT(N1+I) = PSOPTC(IS+I-1)
   30 CONTINUE
      GO TO 35
   31 DO 32 I=1,N1
      XPLOT(I) = S1(NHI-I+1)
      IF(ICOMP.EQ.0) YPLOT(I) = PSOPT(NHI-I+1)
      IF(ICOMP.EQ.1) YPLOT(I) = PSOPTC(NHI-I+1)
   32 CONTINUE
      DO 33 I=1,N11
      XPLOT(N1+I) = S1(NHI+I)
      IF(ICOMP.EQ.0) YPLOT(N1+I) = PSOPT(NHI+I)
      IF(ICOMP.EQ.1) YPLOT(N1+I) = PSOPTC(NHI+I)
   33 CONTINUE
   35 CALL CALPLT(XPLOT,YPLOT,KKK,P)
      IF(K1.EQ.2) GO TO 61
      DO 40 I =1,N1
      IF(ICOMP.EQ.0) YPLOT(I) = XMACH(NHI+I-1)
      IF(ICOMP.EQ.1) YPLOT(I) = CMACH(NHI+I-1)
   40 CONTINUE
      DO 50 I= 1,N11
      IF(ICOMP.EQ.0) YPLOT(N1+I) = XMACH(IS+I-1)
      IF(ICOMP.EQ.1) YPLOT(N1+I) = CMACH(IS+I-1)
   50 CONTINUE
      GO TO 65
   61 DO 62 I=1,N1
      IF(ICOMP.EQ.0) YPLOT(I)= XMACH(NHI-I+1)
      IF(ICOMP.EQ.1) YPLOT(I)= CMACH(NHI-I+1)
   62 CONTINUE
      DO 63 I=1,N11
      IF(ICOMP.EQ.0) YPLOT(N1+I) = XMACH(NHI+I)
      IF(ICOMP.EQ.1) YPLOT(N1+I) = CMACH(NHI+I)
   63 CONTINUE
   65 DO 67 I=1,3
      YLABEL(I)=YDD(I)
   67 CONTINUE
      NY = 16
      P(7) = 2.0
      CALL CALPLT(XPLOT,YPLOT,KKK,P)
      RETURN
      END
```

TEST CASE INPUT AND OUTPUT

```
GEOMETRY ONLY, SCIRCLE RELEASE 2-5 FRESH DELS AT START OF EACH BODY
                      INPUT FILE DUMP
                2-D OCSEE MOD 3A
  16.0      -2.0      1.0       8.0       -4.0      1.0
 OCSH3A   23Y
  2.0       .3        .75   0.0
  6
 -1.0      -5.0      5.0   20
 -0.5      -5.0      5.0   20
  1.0      -2.2      2.2   20
  2.096    -2.1      2.1   20
  4.096    -2.1      2.1   20
 12.009    -3.1      3.1   20
   1.       6.
  10.
  36.0      12.009
 -3.9603     -3.9603
  1.0
 12.009     2.669
 -3.9603     -3.9603
 1000.      1.7667    2.2463
  4.0       2.669                                    0.0       0.0
 -3.9603    -3.9603                                 -3.326     0.0
 1000.      2.         2.
  0.0       0.0
 -5.0      -3.326                                  2.096      4.0
 -3.0                                               -2.278    -2.278
  0.0       2.096      17.009                     14.0
 -2.278    -2.278     -3.287                        -3.287
  1.0
 12.009     36.0
 -3.2870   -3.2870
  0.0       0.0
```

```
GEOMETRY ONLY, SCIRCLE RELEASE 2-5 FRESH DELS AT START OF EACH BODY

CASE QCSH3A                                2-D QCSEE MOD 3A

FLAG INPUT, 1ST RECORD - FORFOD. 2ND - PUNCH,PLOT,REDO FLAGS
0000        C
QCSH3A   23Y   010 0 0          0          000 0 0

     NO. OF BODIES = 2.     DELS =    .300     DELSMX =    .750     XRI =    .000000

**** HUB *********

        ENREED               STRAIGHT LINE
        10.000        X         2.6000+01      1.2009+01
                      Y        -3.9603+00     -3.9603+00

   LAST POINT K=   35, X=   .12009+02, Y=  -.39603+01,KAPPA=   .00000  ,DY/DX=   .00000  ,ALPHA=   .00000

        ENREED               STRAIGHT LINE
        1.000         X         1.2009+01      2.6690+00
                      Y        -3.9603+00     -3.9603+00

   LAST POINT K=   66, X=   .26690+01, Y=  -.39603+01,KAPPA=   .00000  ,DY/DX=   .00000  ,ALPHA=   .00000
 ENREED=   1000.00

        EXPONENTS            SUPERELLIPSE
        P =  1.767    X         4.0000+00      2.6690+00      0.0000      0.0000      0.0000      0.0000
        Q =  2.246    Y        -3.9603+00     -3.9603+00      0.0000      0.0000     -3.3260+00   0.0000

   P =     .17667000+01    A =     .26690000+01     XO =    .26690000+01
   Q =     .22463000+01    B =     .63429999+00     YO =   -.33260000+01   OMEGA =    .00000000

        8  ITERATIONS---
      DELS IN =   .30129   DELS =   .24226   DELS OUT =   .08685   DSTEST =   .00055   FINAL PACE=   .05000

   LAST POINT K=   85, X=   .00000   , Y=  -.33260+01,KAPPA=  -.18483+01,DY/DX=  -.99999+05,ALPHA=  -.89999+02
 ENREED=   1000.00

        EXPONENTS            SUPERELLIPSE
        P =  2.000    X         0.0000         0.0000         0.0000      0.0000      2.0960+00    4.0000+00
        Q =  2.000    Y        -5.0000+00     -3.3260+00      0.0000      0.0000     -2.2780+00   -2.2780+00

   P =     .20000000+01    A =     .10480000+01     XO =   -.16740000+01
   Q =     .20000000+01    B =     .20960000+01     YO =   -.29040000+01   OMEGA =    .00000000

        8  ITERATIONS---
      DELS IN =   .08685   DELS =   .08685   DELS OUT =   .25072   DSTEST =   .00249   FINAL PACE=   .05185

   LAST POINT K=  105, X=   .20960+01, Y=  -.22780+01,KAPPA=  -.23855+00,DY/DX=   .00000  ,ALPHA=   .00000

        ENREED               CUBIC
        -3.000        X         0.0000         2.0960+00      1.2009+01      1.4000+01
                      Y        -2.2780+00     -2.2780+00     -3.2870+00     -3.2870+00

        2  ITERATIONS   A =   2.07160-03   B =  -4.38299-02   C =   1.56432-01   D =  -2.43246+00
      DELS IN =   .25072   DELS =   .24871   DELS OUT =   .24871   DSTEST =   .00073

   LAST POINT K=  143, X=   .12009+02, Y=  -.32870+01,KAPPA=   .61616-01,DY/DX=   .44860-04,ALPHA=   .25703-02
```

GEOMETRY ONLY, SCIRCLE RELEASE 2-5 FRESH DFLS AT START OF EACH BODY

ENREED		STRAIGHT LINE	
1.000	X	1.2009+01	3.6000+01
	Y	-3.2870+00	-3.2870+00

LAST POINT K= 178, X= .36000+02, Y= -.32870+01,KAPPA= .00000 ,DY/DX= .00000 ,ALPHA= .00000

**** SHROUD ******

HUB MIRRORED INTO Y CENTERLINE = .000

INPUT FOR THE COMBINE PROGRAM NT(1)= 367 NT(2)= 354 NHUBMX= 177 NP= 120

BODY 1 CO-ORDINATES	X	Y	KAPPA	DY/DX	ALPHA	S	S-S(2)	DELTAS
1	.36000+02	-.39603+01	.00000	.00000	.00000	.00000	-.36185+02	.00000
2	.35250+02	-.39603+01	.00000	.00000	.00000	.75043+00	-.35435+02	.75043+00
3	.34499+02	-.39603+01	.00000	.00000	.00000	.15009+01	-.34684+02	.75043+00
4	.33749+02	-.39603+01	.00000	.00000	.00000	.22513+01	-.33934+02	.75043+00
5	.32998+02	-.39603+01	.00000	.00000	.00000	.30017+01	-.33184+02	.75043+00
6	.32248+02	-.39603+01	.00000	.00000	.00000	.37521+01	-.32433+02	.75043+00
7	.31497+02	-.39603+01	.00000	.00000	.00000	.45026+01	-.31683+02	.75043+00
8	.30747+02	-.39603+01	.00000	.00000	.00000	.52530+01	-.30932+02	.75043+00
9	.29997+02	-.39603+01	.00000	.00000	.00000	.60034+01	-.30182+02	.75043+00
10	.29246+02	-.39603+01	.00000	.00000	.00000	.67539+01	-.29431+02	.75043+00
11	.28496+02	-.39603+01	.00000	.00000	.00000	.75043+01	-.28681+02	.75043+00
12	.27745+02	-.39603+01	.00000	.00000	.00000	.82547+01	-.27931+02	.75043+00
13	.26995+02	-.39603+01	.00000	.00000	.00000	.90052+01	-.27180+02	.75043+00
14	.26244+02	-.396[illegible]+01	.00000	.00000	.00000	.97556+01	-.26430+02	.75043+00
15	.25494+02	-.396[illegible]+01	.00000	.00000	.00000	.10506+02	-.25679+02	.75043+00
16	.24744+02	-.396[illegible]+01	.00000	.00000	.00000	.11256+02	-.24929+02	.75043+00
17	.23993+02	-.396[illegible]+01	.00000	.00000	.00000	.12007+02	-.24178+02	.75043+00
18	.23243+02	-.396[illegible]+01	.00000	.00000	.00000	.12757+02	-.23428+02	.75043+00
19	.22492+02	-.39603+01	.00000	.00000	.00000	.13508+02	-.22678+02	.75043+00
20	.21742+02	-.39603+01	.00000	.00000	.00000	.14258+02	-.21927+02	.75043+00
21	.20991+02	-.39603+01	.00000	.00000	.00000	.15009+02	-.21177+02	.75043+00
22	.20241+02	-.39603+01	.00000	.00000	.00000	.15759+02	-.20426+02	.75043+00
23	.19491+02	-.39603+01	.00000	.00000	.00000	.16509+02	-.19676+02	.75043+00
24	.18740+02	-.39603+01	.00000	.00000	.00000	.17260+02	-.18925+02	.75043+00
25	.17990+02	-.39603+01	.00000	.00000	.00000	.18010+02	-.18175+02	.75043+00
26	.17239+02	-.39603+01	.00000	.00000	.00000	.18761+02	-.17425+02	.75043+00
27	.16489+02	-.39603+01	.00000	.00000	.00000	.19511+02	-.16674+02	.75043+00
28	.15738+02	-.39603+01	.00000	.00000	.00000	.20262+02	-.15924+02	.75043+00
29	.14988+02	-.39603+01	.00000	.00000	.00000	.21012+02	-.15173+02	.75043+00
30	.14241+02	-.39603+01	.00000	.00000	.00000	.21759+02	-.14427+02	.74650+00
31	.13619+02	-.39603+01	.00000	.00000	.00000	.22381+02	-.13805+02	.62208+00
32	.13101+02	-.39603+01	.00000	.00000	.00000	.22899+02	-.13286+02	.51840+00
33	.12669+02	-.39603+01	.00000	.00000	.00000	.23331+02	-.12854+02	.43200+00
34	.12309+02	-.39603+01	.00000	.00000	.00000	.23691+02	-.12494+02	.36000+00
35	.12009+02	-.39603+01	.00000	.00000	.00000	.23991+02	-.12194+02	.30000+00
36	.11708+02	-.39603+01	.00000	.00000	.00000	.24292+02	-.11893+02	.30129+00
37	.11406+02	-.39603+01	.00000	.00000	.00000	.24594+02	-.11592+02	.30129+00
38	.11105+02	-.39603+01	.00000	.00000	.00000	.24895+02	-.11290+02	.30129+00
39	.10804+02	-.39603+01	.00000	.00000	.00000	.25196+02	-.10989+02	.30129+00
40	.10503+02	-.39603+01	.00000	.00000	.00000	.25497+02	-.10688+02	.30129+00
41	.10201+02	-.39603+01	.00000	.00000	.00000	.25799+02	-.10387+02	.30129+00
42	.99000+01	-.39603+01	.00000	.00000	.00000	.26100+02	-.10085+02	.30129+00

GEOMETRY ONLY, SCIRCLE RELEASE 2-5 FRESH DELS AT START OF EACH BODY

43	.95987+01	-.39603+01	.00000	.00000	.00000	.26401+02	-.97840+01	.30129+00
44	.92974+01	-.39603+01	.00000	.00000	.00000	.26703+02	-.94827+01	.30129+00
45	.89961+01	-.39603+01	.00000	.00000	.00000	.27004+02	-.91814+01	.30129+00
46	.86948+01	-.39603+01	.00000	.00000	.00000	.27305+02	-.88801+01	.30129+00
47	.83935+01	-.39603+01	.00000	.00000	.00000	.27606+02	-.85789+01	.30129+00
48	.80922+01	-.39603+01	.00000	.00000	.00000	.27908+02	-.82776+01	.30129+00
49	.77909+01	-.39603+01	.00000	.00000	.00000	.28209+02	-.79763+01	.30129+00
50	.74896+01	-.39603+01	.00000	.00000	.00000	.28510+02	-.76750+01	.30129+00
51	.71884+01	-.39603+01	.00000	.00000	.00000	.28812+02	-.73737+01	.30129+00
52	.68871+01	-.39603+01	.00000	.00000	.00000	.29113+02	-.70724+01	.30129+00
53	.65858+01	-.39603+01	.00000	.00000	.00000	.29414+02	-.67711+01	.30129+00
54	.62845+01	-.39603+01	.00000	.00000	.00000	.29716+02	-.64698+01	.30129+00
55	.59832+01	-.39603+01	.00000	.00000	.00000	.30017+02	-.61685+01	.30129+00
56	.56819+01	-.39603+01	.00000	.00000	.00000	.30318+02	-.58672+01	.30129+00
57	.53806+01	-.39603+01	.00000	.00000	.00000	.30619+02	-.55660+01	.30129+00
58	.50793+01	-.39603+01	.00000	.00000	.00000	.30921+02	-.52647+01	.30129+00
59	.47780+01	-.39603+01	.00000	.00000	.00000	.31222+02	-.49634+01	.30129+00
60	.44767+01	-.39603+01	.00000	.00000	.00000	.31523+02	-.46621+01	.30129+00
61	.41755+01	-.39603+01	.00000	.00000	.00000	.31825+02	-.43608+01	.30129+00
62	.38742+01	-.39603+01	.00000	.00000	.00000	.32126+02	-.40595+01	.30129+00
63	.35729+01	-.39603+01	.00000	.00000	.00000	.32427+02	-.37582+01	.30129+00
64	.32716+01	-.39603+01	.00000	.00000	.00000	.32728+02	-.34569+01	.30129+00
65	.29703+01	-.39603+01	.00000	.00000	.00000	.33030+02	-.31556+01	.30129+00
66	.26690+01	-.39603+01	.99999+05	.00000	.00000	.33331+02	-.28543+01	.30129+00
67	.24389+01	-.39566+01	-.97327-01	-.28761-01	-.16474+01	.33561+02	-.26242+01	.23017+00
68	.22203+01	-.39481+01	-.87852-01	-.48804-01	-.27941+01	.33780+02	-.24055+01	.21871+00
69	.20129+01	-.39360+01	-.86760-01	-.66920-01	-.38285+01	.33988+02	-.21977+01	.20780+00
70	.18160+01	-.39212+01	-.89803-01	-.84391-01	-.48238+01	.34185+02	-.20002+01	.19744+00
71	.16292+01	-.39038+01	-.96059-01	-.10192+00	-.58196+01	.34373+02	-.18126+01	.18760+00
72	.14520+01	-.38841+01	-.10553+00	-.12005+00	-.68457+01	.34551+02	-.16344+01	.17825+00
73	.12841+01	-.38624+01	-.11872+00	-.13929+00	-.79299+01	.34720+02	-.14650+01	.16937+00
74	.11249+01	-.38386+01	-.13667+00	-.16022+00	-.91027+01	.34881+02	-.13040+01	.16095+00
75	.97412+00	-.38127+01	-.16109+00	-.18355+00	-.10401+02	.35034+02	-.11511+01	.15296+00
76	.83145+00	-.37847+01	-.19479+00	-.21027+00	-.11874+02	.35180+02	-.10057+01	.14539+00
77	.69661+00	-.37543+01	-.24254+00	-.24180+00	-.13593+02	.35318+02	-.86747+00	.13823+00
78	.56937+00	-.37212+01	-.31277+00	-.28042+00	-.15665+02	.35449+02	-.73599+00	.13147+00
79	.44963+00	-.36848+01	-.42159+00	-.33003+00	-.18264+02	.35574+02	-.61085+00	.12515+00
80	.33744+00	-.36443+01	-.60257+00	-.39803+00	-.21704+02	.35694+02	-.49155+00	.11930+00
81	.23316+00	-.35979+01	-.93469+00	-.50087+00	-.26605+02	.35808+02	-.37742+00	.11412+00
82	.14096+00	-.35446+01	-.15981+01	-.67616+00	-.34065+02	.35914+02	-.27095+00	.10647+00
83	.63937-01	-.34806+01	-.30351+01	-.10661+01	-.46833+02	.36015+02	-.17076+00	.10020+00
84	.16302-01	-.34104+01	-.49970+01	-.22986+01	-.66489+02	.36099+02	-.85934-01	.84823-01
85	.00000	-.33260+01	-.19084+01	.99900+03	.90000+02	.36185+02	.00000	.85934-01
86	.64698-02	-.32437+01	-.18566+01	.63440+01	.81042+02	.36268+02	.82596-01	.82596-01
87	.24406-01	-.31665+01	-.17255+01	.32477+01	.72886+02	.36347+02	.16178+00	.79179-01
88	.50514-01	-.30973+01	-.15620+01	.72361+01	.65905+02	.36421+02	.23576+00	.73988-01
89	.82491-01	-.30349+01	-.13964+01	.17291+01	.59958+02	.36491+02	.30590+00	.70138-01
90	.12358+00	-.29715+01	-.12257+01	.13908+01	.54284+02	.36567+02	.38147+00	.75566-01
91	.17420+00	-.29077+01	-.10621+01	.11486+01	.48956+02	.36648+02	.46288+00	.81413-01
92	.23467+00	-.28442+01	-.91354+00	.96575+00	.44002+02	.36736+02	.55059+00	.87711-01
93	.30279+00	-.27834+01	-.78751+00	.82623+00	.39564+02	.36827+02	.64187+00	.91278-01
94	.38147+00	-.27232+01	-.67846+00	.71103+00	.35414+02	.36926+02	.74097+00	.99097-01
95	.47113+00	-.26640+01	-.58600+00	.61362+00	.31534+02	.37034+02	.84839+00	.10742+00
96	.57218+00	-.26064+01	-.50871+00	.52941+00	.27897+02	.37150+02	.96469+00	.11630+00
97	.68511+00	-.25510+01	-.44473+00	.45511+00	.24471+02	.37276+02	.10905+01	.12580+00
98	.81046+00	-.24983+01	-.39220+00	.38827+00	.21220+02	.37412+02	.12265+01	.13598+00
99	.94882+00	-.24489+01	-.34942+00	.32698+00	.18107+02	.37559+02	.13734+01	.14691+00

GEOMETRY ONLY, SCIRCLE RELEASE 2-5 FRESH DELS AT START OF EACH BODY

100	.11009+01	-.24036+01	-.31494+00	.26972+00	.15095+02	.37717+02	.15320+01	.15864+00
101	.12673+01	-.23634+01	-.28761+00	.21521+00	.12145+02	.37889+02	.17033+01	.17126+00
102	.14490+01	-.23292+01	-.26661+00	.16227+00	.92168+01	.38073+02	.18881+01	.18485+00
103	.16467+01	-.23024+01	-.25144+00	.10973+00	.62623+01	.38273+02	.20876+01	.19950+00
104	.18612+01	-.22846+01	-.24196+00	.56356-01	.32255+01	.38488+02	.23029+01	.21529+00
105	.20960+01	-.22780+01	-.61607-01	-.18626-08	-.10672-06	.38723+02	.25378+01	.23485+00
106	.23417+01	-.22798+01	-.58534-01	-.14761-01	-.84568+00	.38969+02	.27835+01	.24569+00
107	.25894+01	-.22852+01	-.55406-01	-.28882-01	-.16543+01	.39217+02	.30312+01	.24773+00
108	.28390+01	-.22942+01	-.52232-01	-.42342-01	-.24246+01	.39466+02	.32810+01	.24978+00
109	.30965+01	-.23064+01	-.49022-01	-.55122-01	-.31551+01	.39718+02	.35328+01	.25182+00
110	.33439+01	-.23219+01	-.45786-01	-.67201-01	-.38445+01	.39972+02	.37867+01	.25385+00
111	.35991+01	-.23406+01	-.42531-01	-.78559-01	-.44919+01	.40228+02	.40425+01	.25586+00
112	.38560+01	-.23621+01	-.39262-01	-.89177-01	-.50960+01	.40486+02	.43003+01	.25781+00
113	.41145+01	-.23865+01	-.35987-01	-.99035-01	-.56558+01	.40745+02	.45600+01	.25972+00
114	.43747+01	-.24134+01	-.32709-01	-.10811+00	-.61705+01	.41007+02	.48216+01	.26155+00
115	.46363+01	-.24428+01	-.29432-01	-.11640+00	-.66392+01	.41270+02	.50849+01	.26329+00
116	.48994+01	-.24744+01	-.26158-01	-.12387+00	-.70611+01	.41535+02	.53498+01	.26493+00
117	.51637+01	-.25081+01	-.22890-01	-.13051+00	-.74355+01	.41802+02	.56163+01	.26646+00
118	.54292+01	-.25435+01	-.19627-01	-.13630+00	-.77617+01	.42069+02	.58841+01	.26786+00
119	.56958+01	-.25805+01	-.16371-01	-.14124+00	-.80392+01	.42339+02	.61533+01	.26913+00
120	.59633+01	-.26189+01	-.13121-01	-.14531+00	-.82675+01	.42609+02	.64235+01	.27024+00
121	.62316+01	-.26583+01	-.98749-02	-.14849+00	-.84462+01	.42880+02	.66947+01	.27120+00
122	.65006+01	-.26986+01	-.66324-02	-.15079+00	-.85748+01	.43152+02	.69667+01	.27199+00
123	.67701+01	-.27394+01	-.33912-02	-.15218+00	-.86530+01	.43425+02	.72393+01	.27261+00
124	.70401+01	-.27806+01	-.14931-03	-.15268+00	-.86807+01	.43698+02	.75124+01	.27305+00
125	.73102+01	-.28218+01	.30954-02	-.15227+00	-.86577+01	.43971+02	.77857+01	.27331+00
126	.75802+01	-.28628+01	.63412-02	-.15095+00	-.85839+01	.44244+02	.80587+01	.27305+00
127	.78498+01	-.29032+01	.95899-02	-.14873+00	-.84595+01	.44517+02	.83313+01	.27259+00
128	.81188+01	-.29428+01	.12843-01	-.14561+00	-.82847+01	.44789+02	.86032+01	.27195+00
129	.83872+01	-.29914+01	.16103-01	-.14161+00	-.80599+01	.45060+02	.88744+01	.27114+00
130	.86548+01	-.30186+01	.19370-01	-.13672+00	-.77854+01	.45330+02	.91445+01	.27016+00
131	.89214+01	-.30543+01	.22645-01	-.13097+00	-.74616+01	.45599+02	.94136+01	.26903+00
132	.91870+01	-.30882+01	.25928-01	-.12436+00	-.70890+01	.45867+02	.96813+01	.26775+00
133	.94514+01	-.31202+01	.29217-01	-.11691+00	-.66683+01	.46133+02	.99477+01	.26633+00
134	.97146+01	-.31499+01	.32511-01	-.10864+00	-.62001+01	.46398+02	.10212+02	.26480+00
135	.99763+01	-.31771+01	.35808-01	-.99550-01	-.56851+01	.46661+02	.10476+02	.26315+00
136	.10237+02	-.32018+01	.39104-01	-.89672-01	-.51241+01	.46922+02	.10737+02	.26140+00
137	.10495+02	-.32236+01	.42394-01	-.79020-01	-.45181+01	.47182+02	.10997+02	.25957+00
138	.10752+02	-.32425+01	.45672-01	-.67613-01	-.38681+01	.47440+02	.11254+02	.25767+00
139	.11007+02	-.32582+01	.48932-01	-.55471-01	-.31750+01	.47695+02	.11510+02	.25572+00
140	.11261+02	-.32706+01	.52166-01	-.42613-01	-.24401+01	.47949+02	.11764+02	.25374+00
141	.11512+02	-.32797+01	.[illegible]65-01	-.29061-01	-.16646+01	.48201+02	.12015+02	.25173+00
142	.11762+02	-.32852+01	.[illegible]18-01	-.14835-01	-.84992+00	.48450+02	.12265+02	.24970+00
143	.12009+02	-.32870+01	.[illegible]00	.00000	.00000	.48698+02	.12513+02	.24769+00
144	.12258+02	-.32870+01	.[illegible]00	.00000	.00000	.48947+02	.12762+02	.24871+00
145	.12556+02	-.32870+01	.[illegible]00	.00000	.00000	.49245+02	.13060+02	.29845+00
146	.12914+02	-.32870+01	.00000	.00000	.00000	.49603+02	.13418+02	.35814+00
147	.13344+02	-.32870+01	.00000	.00000	.00000	.50033+02	.13848+02	.42977+00
148	.13860+02	-.32870+01	.00000	.00000	.00000	.50549+02	.14364+02	.51573+00
149	.14479+02	-.32870+01	.00000	.00000	.00000	.51168+02	.14982+02	.61887+00
150	.15221+02	-.32870+01	.00000	.00000	.00000	.51910+02	.15725+02	.74265+00
151	.15963+02	-.32870+01	.00000	.00000	.00000	.52653+02	.16467+02	.74210+00
152	.16706+02	-.32870+01	.00000	.00000	.00000	.53395+02	.17209+02	.74210+00
153	.17448+02	-.32870+01	.00000	.00000	.00000	.54137+02	.17951+02	.74210+00
154	.18190+02	-.32870+01	.00000	.00000	.00000	.54879+02	.18694+02	.74210+00
155	.18932+02	-.32870+01	.00000	.00000	.00000	.55621+02	.19436+02	.74210+00
156	.19674+02	-.32870+01	.00000	.00000	.00000	.56363+02	.20178+02	.74210+00

GEOMETRY ONLY, SCIRCLE RELEASE 2-5 FRESH DFLS AT START OF EACH BODY

157	.20416+02	-.32870+01	.00000	.00000	.00000	.57105+02	.20920+02	.74210+00
158	.21158+02	-.32870+01	.00000	.00000	.00000	.57847+02	.21662+02	.74210+00
159	.21900+02	-.32870+01	.00000	.00000	.00000	.58589+02	.22404+02	.74210+00
160	.22642+02	-.32870+01	.00000	.00000	.00000	.59331+02	.23146+02	.74210+00
161	.23384+02	-.32870+01	.00000	.00000	.00000	.60074+02	.23888+02	.74210+00
162	.24126+02	-.32870+01	.00000	.00000	.00000	.60816+02	.24630+02	.74210+00
163	.24869+02	-.32870+01	.00000	.00000	.00000	.61558+02	.25372+02	.74210+00
164	.25611+02	-.32870+01	.00000	.00000	.00000	.62300+02	.26114+02	.74210+00
165	.26353+02	-.32870+01	.00000	.00000	.00000	.63042+02	.26857+02	.74210+00
166	.27095+02	-.32870+01	.00000	.00000	.00000	.63784+02	.27599+02	.74210+00
167	.27837+02	-.32870+01	.00000	.00000	.00000	.64526+02	.28341+02	.74209+00
168	.28579+02	-.32870+01	.00000	.00000	.00000	.65268+02	.29083+02	.74209+00
169	.29321+02	-.32870+01	.00000	.00000	.00000	.66010+02	.29825+02	.74209+00
170	.30063+07	-.32870+01	.00000	.00000	.00000	.66752+02	.30567+02	.74209+00
171	.30805+02	-.32870+01	.00000	.00000	.00000	.67494+02	.31309+02	.74209+00
172	.31547+02	-.32870+01	.00000	.00000	.00000	.68237+02	.32051+02	.74209+00
173	.32290+02	-.32870+01	.00000	.00000	.00000	.68979+02	.32793+02	.74209+00
174	.33032+02	-.32870+01	.00000	.00000	.00000	.69721+02	.33535+02	.74209+00
175	.33774+02	-.32870+01	.00000	.00000	.00000	.70463+02	.34278+02	.74209+00
176	.34516+02	-.32870+01	.00000	.00000	.00000	.71205+02	.35020+02	.74209+00
177	.35258+02	-.32870+01	.00000	.00000	.00000	.71947+02	.35762+02	.74209+00
178	.36000+02	-.32870+01	.00000	.00000	.00000	.72689+02	.36504+02	.74209+00

BODY 2 CO-ORDINATES - X		Y	KAPPA	DY/DX	ALPHA	S	S*(2)-S	DELTAS
179	.36000+02	.32870+01	.00000	.00000	.00000	.72689+02	-.36504+02	.00000
180	.35258+02	.32870+01	.00000	.00000	.00000	.71947+02	-.35762+02	-.74209+00
181	.34516+02	.32870+01	.00000	.00000	.00000	.71205+02	-.35020+02	-.74209+00
182	.33774+02	.32870+01	.00000	.00000	.00000	.70463+02	-.34278+02	-.74209+00
183	.33032+02	.32870+01	.00000	.00000	.00000	.69721+02	-.33535+02	-.74209+00
184	.32290+02	.32870+01	.00000	.00000	.00000	.68979+02	-.32793+02	-.74209+00
185	.31547+02	.32870+01	.00000	.00000	.00000	.68237+02	-.32051+02	-.74209+00
186	.30805+02	.32870+01	.00000	.00000	.00000	.67494+02	-.31309+02	-.74209+00
187	.30063+02	.32870+01	.00000	.00000	.00000	.66752+02	-.30567+02	-.74209+00
188	.29321+02	.32870+01	.00000	.00000	.00000	.66010+02	-.29825+02	-.74209+00
189	.28579+02	.32870+01	.00000	.00000	.00000	.65268+02	-.29083+02	-.74209+00
190	.27837+02	.32870+01	.00000	.00000	.00000	.64526+02	-.28341+02	-.74209+00
191	.27095+02	.32870+01	.00000	.00000	.00000	.63784+02	-.27599+02	-.74209+00
192	.26353+02	.32870+01	.00000	.00000	.00000	.63042+02	-.26857+02	-.74210+00
193	.25611+02	.32870+01	.00000	.00000	.00000	.62300+02	-.26114+02	-.74210+00
194	.24869+02	.32870+01	.00000	.00000	.00000	.61558+02	-.25372+02	-.74210+00
195	.24126+02	.32870+01	.00000	.00000	.00000	.60816+02	-.24630+02	-.74210+00
196	.23384+02	.32870+01	.00000	.00000	.00000	.60074+02	-.23888+02	-.74210+00
197	.22642+02	.32870+01	.00000	.00000	.00000	.59331+02	-.23146+02	-.74210+00
198	.21900+02	.32870+01	.00000	.00000	.00000	.58589+02	-.22404+02	-.74210+00
199	.21158+02	.32870+01	.00000	.00000	.00000	.57847+02	-.21662+02	-.74210+00
200	.20416+02	.32870+01	.00000	.00000	.00000	.57105+02	-.20920+02	-.74210+00
201	.19674+02	.32870+01	.00000	.00000	.00000	.56363+02	-.20178+02	-.74210+00
202	.18932+02	.32870+01	.00000	.00000	.00000	.55621+02	-.19436+02	-.74210+00
203	.18190+02	.32870+01	.00000	.00000	.00000	.54879+02	-.18694+02	-.74210+00
204	.17448+07	.32870+01	.00000	.00000	.00000	.54137+02	-.17951+02	-.74210+00
205	.16706+02	.32870+01	.00000	.00000	.00000	.53395+02	-.17209+02	-.74210+00
206	.15963+02	.32870+01	.00000	.00000	.00000	.52653+02	-.16467+02	-.74210+00
207	.15221+02	.32870+01	.00000	.00000	.00000	.51910+02	-.15725+02	-.74210+00
208	.14479+02	.32870+01	.00000	.00000	.00000	.51168+02	-.14982+02	-.74265+00
209	.13860+02	.32870+01	.00000	.00000	.00000	.50549+02	-.14364+02	-.61887+00
210	.13344+02	.32870+01	.00000	.00000	.00000	.50033+02	-.13848+02	-.51573+00

GEOMETRY ONLY, SCIRCLE RELEASE 2-5 FRESH DFLS AT START OF EACH BODY

211	.12914+02	.32870+01	.00000	.00000	.00000	.49603+02	-.13418+02	-.42977+00
212	.12556+02	.32870+01	.00000	.00000	.00000	.49245+02	-.13066+02	-.35814+00
213	.12258+02	.32870+01	.00000	.00000	.00000	.48947+02	-.12762+02	-.29845+00
214	.12009+02	.32870+01	.00000	.00000	.00000	.48698+02	-.12513+02	-.24871+00
215	.11762+02	.32852+01	-.58518-01	.14835-01	.64992+00	.48450+02	-.12265+02	-.24769+00
216	.11512+02	.32797+01	-.55365-01	.29061-01	.16646+01	.48201+02	-.12015+02	-.24970+00
217	.11261+02	.32706+01	-.52166-01	.42613-01	.24401+01	.47949+02	-.11764+02	-.25173+00
218	.11007+02	.32582+01	-.48932-01	.55471-01	.31750+01	.47695+02	-.11510+02	-.25374+00
219	.10752+02	.32425+01	-.45672-01	.67613-01	.38681+01	.47440+02	-.11254+02	-.25572+00
220	.10495+02	.32236+01	-.42394-01	.79020-01	.45181+01	.47182+02	-.10997+02	-.25767+00
221	.10237+02	.32018+01	-.39104-01	.89672-01	.51241+01	.46922+02	-.10737+02	-.25957+00
222	.99763+01	.31771+01	-.35808-01	.99550-01	.56851+01	.46661+02	-.10476+02	-.26140+00
223	.97146+01	.31499+01	-.32511-01	.10864+00	.62001+01	.46398+02	-.10212+02	-.26315+00
224	.94514+01	.31202+01	-.29217-01	.11691+00	.66683+01	.46133+02	-.99477+01	-.26480+00
225	.91870+01	.30882+01	-.25928-01	.12436+00	.70890+01	.45867+02	-.96813+01	-.26633+00
226	.89214+01	.30543+01	-.22645-01	.13097+00	.74616+01	.45599+02	-.94136+01	-.26775+00
227	.86548+01	.30186+01	-.19370-01	.13672+00	.77854+01	.45330+02	-.91445+01	-.26903+00
228	.83872+01	.29814+01	-.16103-01	.14161+00	.80599+01	.45060+02	-.88744+01	-.27016+00
229	.81188+01	.29428+01	-.12843-01	.14561+00	.82847+01	.44789+02	-.86032+01	-.27114+00
230	.78498+01	.29032+01	-.95899-02	.14873+00	.84595+01	.44517+02	-.83313+01	-.27195+00
231	.75802+01	.28628+01	-.63412-02	.15095+00	.85839+01	.44244+02	-.80587+01	-.27259+00
232	.73102+01	.28218+01	-.30954-02	.15227+00	.86577+01	.43971+02	-.77857+01	-.27305+00
233	.70401+01	.27806+01	.14931-03	.15268+00	.86807+01	.43698+02	-.75124+01	-.27331+00
234	.67701+01	.27394+01	.33912-02	.15218+00	.86530+01	.43425+02	-.72393+01	-.27305+00
235	.65006+01	.26986+01	.66324-02	.15079+00	.85748+01	.43152+02	-.69667+01	-.27261+00
236	.62316+01	.26583+01	.98749-02	.14849+00	.84462+01	.42880+02	-.66947+01	-.27199+00
237	.59633+01	.26189+01	.13121-01	.14531+00	.82675+01	.42609+02	-.64235+01	-.27120+00
238	.56958+01	.25805+01	.16371-01	.14124+00	.80392+01	.42339+02	-.61533+01	-.27024+00
239	.54292+01	.25435+01	.19627-01	.13630+00	.77617+01	.42069+02	-.58841+01	-.26913+00
240	.51637+01	.25081+01	.22890-01	.13051+00	.74355+01	.41802+02	-.56163+01	-.26786+00
241	.48994+01	.24744+01	.26158-01	.12387+00	.70611+01	.41535+02	-.53498+01	-.26646+00
242	.46363+01	.24428+01	.29432-01	.11640+00	.66392+01	.41270+02	-.50849+01	-.26493+00
243	.43747+01	.24134+01	.32709-01	.10811+00	.61705+01	.41007+02	-.48216+01	-.26329+00
244	.41145+01	.23865+01	.35987-01	.99035-01	.56558+01	.40745+02	-.45600+01	-.26155+00
245	.38560+01	.23621+01	.39262-01	.89177-01	.50960+01	.40486+02	-.43003+01	-.25972+00
246	.35991+01	.23406+01	.42531-01	.78559-01	.44919+01	.40228+02	-.40425+01	-.25781+00
247	.33439+01	.23219+01	.45786-01	.67201-01	.38445+01	.39972+02	-.37867+01	-.25586+00
248	.30905+01	.23064+01	.49022-01	.55122-01	.31551+01	.39718+02	-.35328+01	-.25385+00
249	.28390+01	.22942+01	.52232-01	.42342-01	.24246+01	.39466+02	-.32810+01	-.25182+00
250	.25894+01	.22852+01	.55406-01	.28882-01	.16543+01	.39217+02	-.30312+01	-.24978+00
251	.23417+01	.22798+01	.58534-01	.14761-01	.84568+00	.38969+02	-.27835+01	-.24773+00
252	.20960+01	.22780+01	.61607-01	.18626-08	.10672-06	.38723+02	-.25378+01	-.24569+00
253	.18612+01	.22846+01	.24196+00	-.56356-01	-.32255+01	.38488+02	-.23029+01	-.23485+00
254	.16467+01	.23024+01	.25144+00	-.10973+00	-.62623+01	.38273+02	-.20876+01	-.21529+00
255	.14490+01	.23292+01	.26661+00	-.16227+00	-.92168+01	.38073+02	-.18881+01	-.19950+00
256	.12673+01	.23634+01	.28761+00	-.21521+00	-.12145+02	.37889+02	-.17033+01	-.18485+00
257	.11009+01	.24036+01	.31494+00	-.26972+00	-.15095+02	.37717+02	-.15320+01	-.17126+00
258	.94882+00	.24489+01	.34942+00	-.32698+00	-.18107+02	.37559+02	-.13734+01	-.15864+00
259	.81046+00	.24983+01	.39220+00	-.38827+00	-.21220+02	.37412+02	-.12265+01	-.14691+00
260	.68511+00	.25510+01	.44473+00	-.45511+00	-.24471+02	.37276+02	-.10905+01	-.13598+00
261	.57218+00	.26064+01	.50871+00	-.52941+00	-.27897+02	.37150+02	-.96469+00	-.12580+00
262	.47113+00	.26640+01	.58600+00	-.61362+00	-.31534+02	.37034+02	-.84839+00	-.11630+00
263	.38147+00	.27232+01	.67846+00	-.71103+00	-.35414+02	.36926+02	-.74097+00	-.10742+00
264	.30279+00	.27834+01	.78751+00	-.82623+00	-.39564+02	.36827+02	-.64187+00	-.99097-01
265	.23467+00	.28442+01	.91354+00	-.96575+00	-.44002+02	.36736+02	-.55059+00	-.91278-01
266	.17420+00	.29077+01	.10621+01	-.11486+01	-.48956+02	.36648+02	-.46288+00	-.87711-01
267	.12358+00	.29715+01	.12257+01	-.13908+01	-.54284+02	.36567+02	-.38147+00	-.81413-01

GEOMETRY ONLY, SCIRCLE RELEASE 2-5 FRESH DELS AT START OF EACH BODY

268	.82491-01	.30349+01	.13964+01	-.17291+01	-.59958+02	.36491+02	-.30590+00	-.75566-01
269	.50514-01	.30973+01	.15620+01	-.22361+01	-.65905+02	.36421+02	-.23576+00	-.70138-01
270	.24406-01	.31665+01	.17255+01	-.32477+01	-.72886+02	.36347+02	-.16176+00	-.73988-01
271	.64698-02	.32437+01	.18566+01	-.63440+01	-.81042+02	.36268+02	-.82596-01	-.79179-01
272	.00000	.33260+01	.19084+01	-.99900+03	-.90000+02	.36185+02	.00000	-.82596-01
273	.16342-01	.34104+01	.49970+01	.72986+01	.66489+02	.36099+02	.85934-01	-.85934-01
274	.63937-01	.34806+01	.30351+01	.10661+01	.46833+02	.36015+02	.17076+00	-.84823-01
275	.14096+00	.35446+01	.15981+01	.67616+00	.34065+02	.35914+02	.27095+00	-.10020+00
276	.23316+00	.35979+01	.93469+00	.50087+00	.26605+02	.35808+02	.37742+00	-.10647+00
277	.33744+00	.36443+01	.60257+00	.39803+00	.21704+02	.35694+02	.49155+00	-.11412+00
278	.44963+00	.36848+01	.42159+00	.33003+00	.18264+02	.35574+02	.61085+00	-.11930+00
279	.56937+00	.37212+01	.31277+00	.28042+00	.15665+02	.35449+02	.73599+00	-.12515+00
280	.69661+00	.37543+01	.24254+00	.24180+00	.13593+02	.35318+02	.86747+00	-.13147+00
281	.83145+00	.37847+01	.19479+00	.21027+00	.11874+02	.35180+02	.10057+01	-.13823+00
282	.97412+00	.38127+01	.16109+00	.18355+00	.10401+02	.35034+02	.11511+01	-.14539+00
283	.11249+01	.38386+01	.13667+00	.16022+00	.91027+01	.34881+02	.13040+01	-.15296+00
284	.12841+01	.38624+01	.11872+00	.13929+00	.79299+01	.34720+02	.14650+01	-.16095+00
285	.14520+01	.38841+01	.10553+00	.12005+00	.68457+01	.34551+02	.16344+01	-.16937+00
286	.16292+01	.39038+01	.96059-01	.10192+00	.58196+01	.34373+02	.18126+01	-.17825+00
287	.18160+01	.39212+01	.89803-01	.84391-01	.48238+01	.34185+02	.20002+01	-.18760+00
288	.20129+01	.39360+01	.86760-01	.66920-01	.38285+01	.33988+02	.21977+01	-.19744+00
289	.22203+01	.39481+01	.87852-01	.48804-01	.27941+01	.33780+02	.24055+01	-.20780+00
290	.24389+01	.39566+01	.97327-01	.28761-01	.16474+01	.33561+02	.26242+01	-.21871+00
291	.26690+01	.39603+01	-.99999+05	.00000	.00000	.33331+02	.28543+01	-.23017+00
292	.29703+01	.39603+01	.00000	.00000	.00000	.33030+02	.31556+01	-.30129+00
293	.32716+01	.39603+01	.00000	.00000	.00000	.32728+02	.34569+01	-.30129+00
294	.35729+01	.39603+01	.00000	.00000	.00000	.32427+02	.37582+01	-.30129+00
295	.38742+01	.39603+01	.00000	.00000	.00000	.32126+02	.40595+01	-.30129+00
296	.41755+01	.39603+01	.00000	.00000	.00000	.31825+02	.43608+01	-.30129+00
297	.44767+01	.39603+01	.00000	.00000	.00000	.31523+02	.46621+01	-.30129+00
298	.47780+01	.39603+01	.00000	.00000	.00000	.31222+02	.49634+01	-.30129+00
299	.50793+01	.39603+01	.00000	.00000	.00000	.30921+02	.52647+01	-.30129+00
300	.53806+01	.39603+01	.00000	.00000	.00000	.30619+02	.55660+01	-.30129+00
301	.56819+01	.39603+01	.00000	.00000	.00000	.30318+02	.58672+01	-.30129+00
302	.59832+01	.39603+01	.00000	.00000	.00000	.30017+02	.61685+01	-.30129+00
303	.62845+01	.39603+01	.00000	.00000	.00000	.29716+02	.64698+01	-.30129+00
304	.65858+01	.39603+01	.00000	.00000	.00000	.29414+02	.67711+01	-.30129+00
305	.68871+01	.39603+01	.00000	.00000	.00000	.29113+02	.70724+01	-.30129+00
306	.71884+01	.39603+01	.00000	.00000	.00000	.28812+02	.73737+01	-.30129+00
307	.74896+01	.39603+01	.00000	.00000	.00000	.28510+02	.76750+01	-.30129+00
308	.77909+01	.39603+01	.00000	.00000	.00000	.28209+02	.79763+01	-.30129+00
309	.80922+01	.39603+01	.00000	.00000	.00000	.27908+02	.82776+01	-.30129+00
310	.83935+01	.39603+01	.00000	.00000	.00000	.27606+02	.85789+01	-.30129+00
311	.86948+01	.39603+01	.00000	.00000	.00000	.27305+02	.88801+01	-.30129+00
312	.89961+01	.39603+01	.00000	.00000	.00000	.27004+02	.91814+01	-.30129+00
313	.92974+01	.39603+01	.00000	.00000	.00000	.26703+02	.94827+01	-.30129+00
314	.95987+01	.39603+01	.00000	.00000	.00000	.26401+02	.97840+01	-.30129+00
315	.99000+01	.39603+01	.00000	.00000	.00000	.26100+02	.10085+02	-.30129+00
316	.10201+02	.39603+01	.00000	.00000	.00000	.25799+02	.10387+02	-.30129+00
317	.10503+02	.39603+01	.00000	.00000	.00000	.25497+02	.10688+02	-.30129+00
318	.10804+02	.39603+01	.00000	.00000	.00000	.25196+02	.10989+02	-.30129+00
319	.11105+02	.39603+01	.00000	.00000	.00000	.24895+02	.11290+02	-.30129+00
320	.11406+02	.39603+01	.00000	.00000	.00000	.24594+02	.11592+02	-.30129+00
321	.11708+02	.39603+01	.00000	.00000	.00000	.24292+02	.11893+02	-.30129+00
322	.12009+02	.39603+01	.00000	.00000	.00000	.23991+02	.12194+02	-.30129+00
323	.12309+02	.39603+01	.00000	.00000	.00000	.23691+02	.12494+02	-.30000+00
324	.12669+02	.39603+01	.00000	.00000	.00000	.23331+02	.12854+02	-.36000+00

GEOMETRY ONLY, SCIRCLE RELEASE 2-5 FRESH DELS AT START OF EACH BODY

325	.13101+02	.39603+01	.00000	.00000	.00000	.22899+02	.13286+02	-.43200+00
326	.13619+02	.39603+01	.00000	.00000	.00000	.22381+02	.13805+02	-.51840+00
327	.14241+02	.39603+01	.00000	.00000	.00000	.21759+02	.14427+02	-.62208+00
328	.14988+02	.39603+01	.00000	.00000	.00000	.21012+02	.15173+02	-.74650+00
329	.15738+02	.39603+01	.00000	.00000	.00000	.20262+02	.15924+02	-.75043+00
330	.16489+02	.39603+01	.00000	.00000	.00000	.19511+02	.16674+02	-.75043+00
331	.17239+02	.39603+01	.00000	.00000	.00000	.18761+02	.17425+02	-.75043+00
332	.17990+02	.39603+01	.00000	.00000	.00000	.18010+02	.18175+02	-.75043+00
333	.18740+02	.39603+01	.00000	.00000	.00000	.17260+02	.18925+02	-.75043+00
334	.19491+02	.39603+01	.00000	.00000	.00000	.16509+02	.19676+02	-.75043+00
335	.20241+02	.39603+01	.00000	.00000	.00000	.15759+02	.20426+02	-.75043+00
336	.20991+02	.39603+01	.00000	.00000	.00000	.15009+02	.21177+02	-.75043+00
337	.21742+02	.39603+01	.00000	.00000	.00000	.14258+02	.21927+02	-.75043+00
338	.22492+02	.39603+01	.00000	.00000	.00000	.13508+02	.22678+02	-.75043+00
339	.23243+02	.39603+01	.00000	.00000	.00000	.12757+02	.23428+02	-.75043+00
340	.23993+02	.39603+01	.00000	.00000	.00000	.12007+02	.24178+02	-.75043+00
341	.24744+02	.39603+01	.00000	.00000	.00000	.11256+02	.24929+02	-.75043+00
342	.25494+02	.39603+01	.00000	.00000	.00000	.10506+02	.25679+02	-.75043+00
343	.26244+02	.39603+01	.00000	.00000	.00000	.97556+01	.26430+02	-.75043+00
344	.26995+02	.39603+01	.00000	.00000	.00000	.90052+01	.27180+02	-.75043+00
345	.27745+02	.39603+01	.00000	.00000	.00000	.82547+01	.27931+02	-.75043+00
346	.28496+02	.39603+01	.00000	.00000	.00000	.75043+01	.28681+02	-.75043+00
347	.29246+02	.39603+01	.00000	.00000	.00000	.67539+01	.29431+02	-.75043+00
348	.29997+02	.39603+01	.00000	.00000	.00000	.60034+01	.30182+02	-.75043+00
349	.30747+02	.39603+01	.00000	.00000	.00000	.52530+01	.30932+02	-.75043+00
350	.31497+02	.39603+01	.00000	.00000	.00000	.45026+01	.31683+02	-.75043+00
351	.32248+02	.39603+01	.00000	.00000	.00000	.37521+01	.32433+02	-.75043+00
352	.32998+02	.39603+01	.00000	.00000	.00000	.30017+01	.33184+02	-.75043+00
353	.33749+02	.39603+01	.00000	.00000	.00000	.22513+01	.33934+02	-.75043+00
354	.34499+02	.39603+01	.00000	.00000	.00000	.15009+01	.34684+02	-.75043+00
355	.35250+02	.39603+01	.00000	.00000	.00000	.75043+00	.35435+02	-.75043+00
356	.36000+02	.39603+01	.00000	.00000	.00000	.00000	.36185+02	-.75043+00

BODY 3 CO-ORDINATES - X Y

357	.36000+02	-.32870+01
358	.36000+02	-.27813+01
359	.36000+02	-.22756+01
360	.36000+02	-.17699+01
361	.36000+02	-.12642+01
362	.36000+02	-.75854+00
363	.36000+02	-.25285+00
364	.36000+02	.25285+00
365	.36000+02	.75854+00
366	.36000+02	.12642+01
367	.36000+02	.17699+01
368	.36000+02	.22756+01
369	.36000+02	.27813+01
370	.36000+02	.32870+01

XRAK	YLO	YHI	NDY
-.10000+01	-.50000+01	.50000+01	20
-.50000+00	-.50000+01	.50000+01	20
.10000+01	-.22000+01	.22000+01	20
.20960+01	-.21000+01	.21000+01	20
.40960+01	-.21000+01	.21000+01	20
.12009+02	-.31000+01	.31000+01	20

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GEOMETRY ONLY, SCIRCLE RELEASE 2-5 FRESH DFLS AT START OF EACH BODY
@FIN
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ORIGINAL PAGE IS
OF POOR QUALITY

PROGRAM .. 23Y

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

UNTRANSFORMED COORDINATE DATA FOR BODY ID = 1, 2-D QCSEE

I	X(I)	Y(I)	I	X(I)	Y(I)
1	36.000000	-3.960300	51	7.188360	-3.960300
2	35.249570	-3.960300	52	6.887070	-3.960300
3	34.499140	-3.960300	53	6.585780	-3.960300
4	33.748710	-3.960300	54	6.284480	-3.960300
5	32.998280	-3.960300	55	5.983190	-3.960300
6	32.247850	-3.960300	56	5.681900	-3.960300
7	31.497420	-3.960300	57	5.380610	-3.960300
8	30.746990	-3.960300	58	5.079320	-3.960300
9	29.996560	-3.960300	59	4.778030	-3.960300
10	29.246130	-3.960300	60	4.476740	-3.960300
11	28.495700	-3.960300	61	4.175450	-3.960300
12	27.745280	-3.960300	62	3.874160	-3.960300
13	26.994850	-3.960300	63	3.572870	-3.960300
14	26.244420	-3.960300	64	3.271580	-3.960300
15	25.493990	-3.960300	65	2.970290	-3.960300
16	24.743560	-3.960300	66	2.669000	-3.960300
17	23.993130	-3.960300	67	2.438860	-3.956570
18	23.242700	-3.960300	68	2.220310	-3.948060
19	22.492270	-3.960300	69	2.012850	-3.936050
20	21.741840	-3.960300	70	1.815980	-3.921170
21	20.991410	-3.960300	71	1.629190	-3.903780
22	20.240980	-3.960300	72	1.452020	-3.884150
23	19.490550	-3.960300	73	1.284050	-3.862400
24	18.740120	-3.960300	74	1.124870	-3.838600
25	17.989690	-3.960300	75	.974120	-3.812740
26	17.239260	-3.960300	76	.831450	-3.784720
27	16.488830	-3.960300	77	.696610	-3.754320
28	15.738400	-3.960300	78	.569370	-3.721220
29	14.987980	-3.960300	79	.449630	-3.684830
30	14.241480	-3.960300	80	.337440	-3.644260
31	13.619400	-3.960300	81	.233160	-3.597890
32	13.101000	-3.960300	82	.140960	-3.544650
33	12.669000	-3.960300	83	.063940	-3.480560
34	12.309000	-3.960300	84	.016300	-3.410370
35	12.009000	-3.960300	85	.000000	-3.326000
36	11.707710	-3.960300	86	.006470	-3.243660
37	11.406420	-3.960300	87	.024410	-3.166540
38	11.105130	-3.960300	88	.050510	-3.097310
39	10.803840	-3.960300	89	.082490	-3.034880
40	10.502550	-3.960300	90	.123580	-2.971460
41	10.201260	-3.960300	91	.174200	-2.907700
42	9.899970	-3.960300	92	.234670	-2.844160
43	9.598660	-3.960300	93	.302790	-2.783410
44	9.297390	-3.960300	94	.381470	-2.723170
45	8.996100	-3.960300	95	.471130	-2.663990
46	8.694810	-3.960300	96	.572180	-2.606420
47	8.393520	-3.960300	97	.685110	-2.550980
48	8.092230	-3.960300	98	.810460	-2.498260
49	7.790940	-3.960300	99	.948820	-2.448900
50	7.489650	-3.960300	100	1.100870	-2.403650

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

UNTRANSFORMED COORDINATE DATA FOR BODY ID = 1, 2-D QCSEE

I	X(I)	Y(I)	I	X(I)	Y(I)
101	1.267340	-2.363380	140	11.260840	-3.270630
102	1.449000	-2.329180	141	11.512400	-3.279660
103	1.646690	-2.302360	142	11.762050	-3.285150
104	1.861240	-2.284590	143	12.009000	-3.287000
105	2.096000	-2.278000	144	12.257710	-3.287000
106	2.341690	-2.279830	145	12.556160	-3.287000
107	2.589360	-2.285250	146	12.914310	-3.287000
108	2.838980	-2.294150	147	13.344080	-3.287000
109	3.090500	-2.306430	148	13.859800	-3.287000
110	3.343880	-2.321940	149	14.478680	-3.287000
111	3.599060	-2.340560	150	15.221320	-3.287000
112	3.855970	-2.362120	151	15.963420	-3.287000
113	4.114540	-2.386470	152	16.705510	-3.287000
114	4.374700	-2.413440	153	17.447610	-3.287000
115	4.636340	-2.442820	154	18.189700	-3.287000
116	4.899380	-2.474440	155	18.931800	-3.287000
117	5.163700	-2.508080	156	19.673900	-3.287000
118	5.429210	-2.543520	157	20.415990	-3.287000
119	5.695780	-2.580530	158	21.158090	-3.287000
120	5.963290	-2.618880	159	21.900180	-3.287000
121	6.231610	-2.658310	160	22.642280	-3.287000
122	6.500600	-2.698590	161	23.384370	-3.287000
123	6.770140	-2.739440	162	24.126470	-3.287000
124	7.040060	-2.780600	163	24.868560	-3.287000
125	7.310250	-2.821820	164	25.610660	-3.287000
126	7.580200	-2.862760	165	26.352750	-3.287000
127	7.849780	-2.903180	166	27.094850	-3.287000
128	8.118820	-2.942790	167	27.836950	-3.287000
129	8.387210	-2.981360	168	28.579040	-3.287000
130	8.654790	-3.018610	169	29.321140	-3.287000
131	8.921440	-3.054320	170	30.063230	-3.287000
132	9.187030	-3.088250	171	30.805330	-3.287000
133	9.451440	-3.120170	172	31.547420	-3.287000
134	9.714570	-3.149860	173	32.289520	-3.287000
135	9.976300	-3.177120	174	33.031610	-3.287000
136	10.236530	-3.201760	175	33.773710	-3.287000
137	10.495180	-3.223600	176	34.515800	-3.287000
138	10.752170	-3.242450	177	35.257900	-3.287000
139	11.007410	-3.258180	178	36.000000	-3.287000

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ELEMENT COORDINATE DATA FOR BODY ID = 1, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
1	36.000000	-3.960300					
	35.624785	-3.960300	.750430	.750430	.000000	-1.000000	.00000
2	35.249570	-3.960300					
	34.874355	-3.960300	.750430	.750430	.000000	-1.000000	.00000
3	34.499140	-3.960300					
	34.123925	-3.960300	.750430	.750430	.000000	-1.000000	.00000
4	33.748710	-3.960300					
	33.373495	-3.960300	.750430	.750430	.000000	-1.000000	.00000
5	32.998280	-3.960300					
	32.623065	-3.960300	.750430	.750430	.000000	-1.000000	.00000
6	32.247850	-3.960300					
	31.872635	-3.960300	.750430	.750430	.000000	-1.000000	.00000
7	31.497420	-3.960300					
	31.122205	-3.960300	.750430	.750430	.000000	-1.000000	.00000
8	30.746990	-3.960300					
	30.371775	-3.960300	.750430	.750430	.000000	-1.000000	.00000
9	29.996560	-3.960300					
	29.621345	-3.960300	.750430	.750430	.000000	-1.000000	.00000
10	29.246130	-3.960300					
	28.870915	-3.960300	.750430	.750430	.000000	-1.000000	.00000
11	28.495700	-3.960300					
	28.120490	-3.960300	.750420	.750420	.000000	-1.000000	.00000
12	27.745280	-3.960300					
	27.370065	-3.960300	.750430	.750430	.000000	-1.000000	.00000
13	26.994850	-3.960300					
	26.619635	-3.960300	.750430	.750430	.000000	-1.000000	.00000
14	26.244420	-3.960300					
	25.869205	-3.960300	.750430	.750430	.000000	-1.000000	.00000
15	25.493990	-3.960300					
	25.118775	-3.960300	.750430	.750430	.000000	-1.000000	.00000
16	24.743560	-3.960300					
	24.368345	-3.960300	.750430	.750430	.000000	-1.000000	.00000
17	23.993130	-3.960300					
	23.617915	-3.960300	.750430	.750430	.000000	-1.000000	.00000
18	23.242700	-3.960300					
	22.867485	-3.960300	.750430	.750430	.000000	-1.000000	.00000
19	22.492270	-3.960300					
	22.117055	-3.960300	.750430	.750430	.000000	-1.000000	.00000
20	21.741840	-3.960300					
	21.366625	-3.960300	.750430	.750430	.000000	-1.000000	.00000
21	20.991410	-3.960300					
	20.616195	-3.960300	.750430	.750430	.000000	-1.000000	.00000
22	20.240980	-3.960300					
	19.865765	-3.960300	.750430	.750430	.000000	-1.000000	.00000
23	19.490550	-3.960300					
	19.115335	-3.960300	.750430	.750430	.000000	-1.000000	.00000
24	18.740120	-3.960300					
	18.364905	-3.960300	.750430	.750430	.000000	-1.000000	.00000
25	17.989690	-3.960300					

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 1, 2-D QCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
	17.614475	-3.960300	.750430	.750430	.000000	-1.000000	.000000
26	17.239260	-3.960300					
	16.864045	-3.960300	.750430	.750430	.000000	-1.000000	.000000
27	16.488830	-3.960300					
	16.113615	-3.960300	.750430	.750430	.000000	-1.000000	.000000
28	15.738400	-3.960300					
	15.363190	-3.960300	.750420	.750420	.000000	-1.000000	.000000
29	14.987980	-3.960300					
	14.614730	-3.960300	.746500	.746500	.000000	-1.000000	.000000
30	14.241480	-3.960300					
	13.930440	-3.960300	.622080	.622080	.000000	-1.000000	.000000
31	13.619400	-3.960300					
	13.360200	-3.960300	.518400	.518400	.000000	-1.000000	.000000
32	13.101000	-3.960300					
	12.865000	-3.960300	.432000	.432000	.000000	-1.000000	.000000
33	12.669000	-3.960300					
	12.489000	-3.960300	.360000	.360000	.000000	-1.000000	.000000
34	12.309000	-3.960300					
	12.159000	-3.960300	.300000	.300000	.000000	-1.000000	.000000
35	12.009000	-3.960300					
	11.858355	-3.960300	.301290	.301290	.000000	-1.000000	.000000
36	11.707710	-3.960300					
	11.557065	-3.960300	.301290	.301290	.000000	-1.000000	.000000
37	11.406420	-3.960300					
	11.255775	-3.960300	.301290	.301290	.000000	-1.000000	.000000
38	11.105130	-3.960300					
	10.954485	-3.960300	.301290	.301290	.000000	-1.000000	.000000
39	10.803840	-3.960300					
	10.653195	-3.960300	.301290	.301290	.000000	-1.000000	.000000
40	10.502550	-3.960300					
	10.351905	-3.960300	.301290	.301290	.000000	-1.000000	.000000
41	10.201260	-3.960300					
	10.050615	-3.960300	.301290	.301290	.000000	-1.000000	.000000
42	9.899970	-3.960300					
	9.749325	-3.960300	.301290	.301290	.000000	-1.000000	.000000
43	9.598680	-3.960300					
	9.448035	-3.960300	.301290	.301290	.000000	-1.000000	.000000
44	9.297390	-3.960300					
	9.146745	-3.960300	.301290	.301290	.000000	-1.000000	.000000
45	8.996100	-3.960300					
	8.845455	-3.960300	.301290	.301290	.000000	-1.000000	.000000
46	8.694810	-3.960300					
	8.544165	-3.960300	.301290	.301290	.000000	-1.000000	.000000
47	8.393520	-3.960300					
	8.242875	-3.960300	.301290	.301290	.000000	-1.000000	.000000
48	8.092230	-3.960300					
	7.941585	-3.960300	.301290	.301290	.000000	-1.000000	.000000
49	7.790940	-3.960300					
	7.640295	-3.960300	.301290	.301290	.000000	-1.000000	.000000
50	7.489650	-3.960300					

POTENTIAL FLOW - - 2-D , 23Y RELEASE 3-1-1 FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 1, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
51	7.339075 7.188360	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
52	7.037715 6.887070	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
53	6.736425 6.585780	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
54	6.435130 6.284480	-3.960300 -3.960300	.301300	.301300	.000000	-1.000000	.000000
55	6.133835 5.983190	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
56	5.832545 5.681900	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
57	5.531245 5.380610	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
58	5.229965 5.079320	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
59	4.928675 4.778030	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
60	4.627385 4.476740	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
61	4.326095 4.175450	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
62	4.024805 3.874160	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
63	3.723515 3.572870	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
64	3.422225 3.271580	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
65	3.120935 2.970290	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
66	2.819645 2.669000	-3.960300 -3.960300	.301290	.301290	.000000	-1.000000	.000000
67	2.553930 2.438860	-3.958435 -3.956570	.230170	.230170	.016205	-.999869	.000000
68	2.329585 2.220310	-3.952315 -3.948060	.218716	.218716	.038909	-.999243	.000000
69	2.116580 2.012850	-3.942055 -3.936050	.207807	.207807	.057794	-.998329	.000000
70	1.914415 1.815980	-3.928610 -3.921170	.197432	.197432	.075368	-.997156	.000000
71	1.722585 1.629190	-3.912475 -3.903780	.187598	.187598	.092698	-.995694	.000000
72	1.540605 1.452020	-3.893965 -3.884150	.178254	.178254	.110124	-.993918	.000000
73	1.368035 1.284050	-3.873275 -3.862400	.169372	.169372	.128415	-.991720	.000000
74	1.204460 1.124870	-3.850500 -3.838600	.160949	.160949	.147872	-.989006	.000000
75	1.049495 .974120	-3.825670 -3.812740	.152952	.152952	.169073	-.985604	.000000

POTENTIAL FLOW - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 1, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
	.902785	-3.798730	.145395	.145395	.192716	-.981255	.000000
76	.831450	-3.784720					
	.764030	-3.769520	.138224	.138224	.219932	-.975515	.000000
77	.696610	-3.754320					
	.632990	-3.737770	.131475	.131475	.251759	-.967790	.000000
78	.569370	-3.721220					
	.509500	-3.703025	.125148	.125148	.290777	-.956791	.000000
79	.449630	-3.684830					
	.393535	-3.664545	.119300	.119300	.340067	-.940401	.000000
80	.337440	-3.644260					
	.285300	-3.621075	.114125	.114125	.406309	-.913736	.000000
81	.233160	-3.597890					
	.187060	-3.571270	.106468	.106468	.560059	-.865992	.000000
82	.140960	-3.544650					
	.102450	-3.512605	.100198	.100198	.639634	-.768679	.000000
83	.063940	-3.480560					
	.040120	-3.445465	.084830	.084830	.827415	-.561591	.000000
84	.016300	-3.410370					
	.008150	-3.368185	.085930	.085930	.981844	-.189689	.000000
85	.000000	-3.326000					
	.003235	-3.284830	.082594	.082594	.996927	.078335	.000000
86	.006470	-3.243660					
	.015440	-3.205100	.079179	.079179	.973994	.226575	.000000
87	.024410	-3.166540					
	.037460	-3.131925	.073986	.073986	.935711	.352767	.000000
88	.050510	-3.097310					
	.066500	-3.066095	.070144	.070144	.890022	.455917	.000000
89	.082490	-3.034880					
	.103035	-3.003170	.075568	.075568	.839247	.543751	.000000
90	.123580	-2.971460					
	.148890	-2.939580	.081411	.081411	.783188	.621785	.000000
91	.174200	-2.907700					
	.204435	-2.875930	.087715	.087715	.724390	.689390	.000000
92	.234670	-2.844160					
	.268730	-2.813785	.091274	.091274	.665580	.746326	.000000
93	.302790	-2.783410					
	.342130	-2.753290	.099093	.099093	.607914	.794002	.000000
94	.381470	-2.723170					
	.426300	-2.693580	.107430	.107430	.550871	.834590	.000000
95	.471130	-2.663990					
	.521655	-2.635205	.116299	.116299	.495018	.868883	.000000
96	.572180	-2.606420					
	.628645	-2.578700	.125805	.125805	.440684	.897662	.000000
97	.685110	-2.550980					
	.747785	-2.524620	.135985	.135985	.387689	.921790	.000000
98	.810460	-2.498260					
	.879640	-2.473580	.146901	.146901	.336009	.941859	.000000
99	.948820	-2.448900					
	1.024845	-2.426275	.158640	.158640	.285237	.958457	.000000
100	1.100870	-2.403650					

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POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 1, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
101	1.184105 1.267340	-2.383515 -2.363380	.171272	.171272	.235124	.971965	.000000
102	1.358170 1.449000	-2.346280 -2.329180	.184851	.184851	.185014	.982736	.000000
103	1.547845 1.646690	-2.315770 -2.302360	.199501	.199501	.134435	.990922	.000000
104	1.753965 1.861240	-2.293475 -2.284590	.215285	.215285	.082542	.996588	.000000
105	1.978670 2.096010	-2.281295 -2.278000	.234852	.234852	.028060	.999606	.000000
106	2.218845 2.341690	-2.278915 -2.279830	.245697	.245697	-.007448	.999972	.000000
107	2.465525 2.589360	-2.282540 -2.285250	.247729	.247729	-.021879	.999761	.000000
108	2.714170 2.838980	-2.289700 -2.294150	.249779	.249779	-.035632	.999365	.000000
109	2.964740 3.090500	-2.300290 -2.306430	.251820	.251820	-.048765	.998810	.000000
110	3.217190 3.343880	-2.314185 -2.321940	.253854	.253854	-.061098	.998132	.000000
111	3.471470 3.599060	-2.331250 -2.340560	.255858	.255858	-.072775	.997348	.000000
112	3.727515 3.855970	-2.351340 -2.362120	.257813	.257813	-.083627	.996497	.000000
113	3.985255 4.114540	-2.374295 -2.386470	.259714	.259714	-.093757	.995595	.000000
114	4.244620 4.374700	-2.399955 -2.413440	.261554	.261554	-.103114	.994670	.000000
115	4.505570 4.636340	-2.428130 -2.442820	.263284	.263284	-.111590	.993754	.000000
116	4.767860 4.899380	-2.458630 -2.474440	.264934	.264934	-.119351	.992852	.000000
117	5.031540 5.163700	-2.491260 -2.508080	.266452	.266452	-.126252	.991998	.000000
118	5.296455 5.429210	-2.525800 -2.543520	.267865	.267865	-.132306	.991209	.000000
119	5.562495 5.695780	-2.562025 -2.580530	.269127	.269127	-.137519	.990499	.000000
120	5.829535 5.963290	-2.599705 -2.618880	.270245	.270245	-.141908	.989880	.000000
121	6.097450 6.231610	-2.638595 -2.658310	.271202	.271202	-.145390	.989374	.000000
122	6.366105 6.500600	-2.678450 -2.698590	.271989	.271989	-.148094	.988973	.000000
123	6.635370 6.770140	-2.719015 -2.739440	.272618	.272618	-.149843	.988710	.000000
124	6.905100 7.040060	-2.760020 -2.780600	.273040	.273040	-.150747	.988572	.000000
125	7.175155 7.310250	-2.801210 -2.821820	.273316	.273316	-.150814	.988562	.000000

POTENTIAL FLOW - - 2-D ,   23Y RELEASE 0-1-1   FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 1,   2-D QCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
	7.445225	-2.842290	.273037	.273037	-.149943	.988695	.000000
126	7.580200	-2.862760					
	7.714996	-2.882970	.272593	.272593	-.148279	.988946	.000000
127	7.849780	-2.903180					
	7.984300	-2.922985	.271940	.271940	-.145657	.989335	.000000
128	8.116820	-2.942790					
	8.253015	-2.962075	.271147	.271147	-.142247	.989831	.000000
129	8.387210	-2.981360					
	8.521000	-2.999985	.270160	.270160	-.137881	.990449	.000000
130	8.654790	-3.018610					
	8.788115	-3.036465	.269030	.269030	-.132736	.991151	.000000
131	8.921440	-3.054320					
	9.054235	-3.071285	.267749	.267749	-.126723	.991938	.000000
132	9.187030	-3.088250					
	9.319235	-3.104210	.266330	.266330	-.119851	.992792	.000000
133	9.451440	-3.120170					
	9.583005	-3.135015	.264800	.264800	-.112122	.993694	.000000
134	9.714570	-3.149860					
	9.845435	-3.163490	.263146	.263146	-.103593	.994620	.000000
135	9.976300	-3.177120					
	10.106415	-3.189440	.261394	.261394	-.094264	.995547	.000000
136	10.236530	-3.201760					
	10.365855	-3.212680	.259570	.259570	-.084139	.996454	.000000
137	10.495180	-3.223600					
	10.623675	-3.233025	.257680	.257680	-.073153	.997321	.000000
138	10.752170	-3.242450					
	10.879790	-3.250315	.255724	.255724	-.061512	.998106	.000000
139	11.007410	-3.258180					
	11.134125	-3.264405	.253736	.253736	-.049067	.998796	.000000
140	11.260840	-3.270630					
	11.386620	-3.275145	.251722	.251722	-.035873	.999356	.000000
141	11.512400	-3.279660					
	11.637225	-3.282405	.249710	.249710	-.021985	.999758	.000000
142	11.762050	-3.285150					
	11.885525	-3.286075	.246957	.246957	-.007491	.999972	.000000
143	12.009000	-3.287000					
	12.133355	-3.287000	.248710	.248710	.000000	1.000000	.000000
144	12.257710	-3.287000					
	12.406935	-3.287000	.298450	.298450	.000000	1.000000	.000000
145	12.556160	-3.287000					
	12.735235	-3.287000	.358150	.358150	.000000	1.000000	.000000
146	12.914310	-3.287000					
	13.129195	-3.287000	.429770	.429770	.000000	1.000000	.000000
147	13.344080	-3.287000					
	13.601940	-3.287000	.515720	.515720	.000000	1.000000	.000000
148	13.859800	-3.287000					
	14.169240	-3.287000	.618880	.618880	.000000	1.000000	.000000
149	14.478680	-3.287000					
	14.850000	-3.287000	.742640	.742640	.000000	1.000000	.000000
150	15.221320	-3.287000					

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 1, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
151	15.592370 15.963420	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
152	16.334465 16.705510	-3.287000 -3.287000	.742090	.742090	.000000	1.000000	.000000
153	17.076560 17.447610	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
154	17.818655 18.189700	-3.287000 -3.287000	.742090	.742090	.000000	1.000000	.000000
155	18.560750 18.931800	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
156	19.302850 19.673900	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
157	20.044945 20.415990	-3.287000 -3.287000	.742090	.742090	.000000	1.000000	.000000
158	20.787040 21.158090	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
159	21.529135 21.900180	-3.287000 -3.287000	.742090	.742090	.000000	1.000000	.000000
160	22.271230 22.642280	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
161	23.013325 23.384370	-3.287000 -3.287000	.742090	.742090	.000000	1.000000	.000000
162	23.755420 24.126470	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
163	24.497515 24.868560	-3.287000 -3.287000	.742090	.742090	.000000	1.000000	.000000
164	25.239610 25.610660	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
165	25.981705 .352750	-3.287000 -3.287000	.742090	.742090	.000000	1.000000	.000000
166	.723800 .094850	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
167	.465900 .836950	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
168	28.207995 28.579040	-3.287000 -3.287000	.742090	.742090	.000000	1.000000	.000000
169	28.950090 29.321140	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
170	29.692185 30.063230	-3.287000 -3.287000	.742090	.742090	.000000	1.000000	.000000
171	30.434280 30.805330	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
172	31.176375 31.547420	-3.287000 -3.287000	.742090	.742090	.000000	1.000000	.000000
173	31.918470 32.289520	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000
174	32.660565 33.031610	-3.287000 -3.287000	.742090	.742090	.000000	1.000000	.000000
175	33.402660 33.773710	-3.287000 -3.287000	.742100	.742100	.000000	1.000000	.000000

ELEMENT COORDINATE DATA FOR BODY ID = 1, 2-D QCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
	34.144755	-3.287000	.742090	.742090	.00000C	1.000000	.000000
176	34.515800	-3.287000					
	34.886850	-3.287000	.742100	.742100	.000000	1.000000	.000000
177	35.257900	-3.287000					
	35.628950	-3.287000	.742100	.742100	.000000	1.000000	.000000
178	36.000000	-3.287000					

SUMDS = 72.688411

THE INTERPRETATION OF MEANINGLESS INPUT WAS ATTEMPTED.
THE FOLLOWING RECORD IS ERRONEOUS OR DOES NOT CORRESPOND TO FORMAT SPECIFICATIONS
2 0 1 2-D QCSEE MOD 3A 2 1 1 1
I/O CALLED AT SEQUENCE NUMBER 000120 OF ELFORM

ORIGINAL PAGE IS
OF POOR QUALITY

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

UNTRANSFORMED COORDINATE DATA FOR BODY ID = 2, 2-D OCSEE

I	X(I)	Y(I)	I	X(I)	Y(I)
1	36.000000	3.287000	51	8.118820	2.942790
2	35.257900	3.287000	52	7.849780	2.903180
3	34.515800	3.287000	53	7.580200	2.862760
4	33.773710	3.287000	54	7.310250	2.821820
5	33.031610	3.287000	55	7.040060	2.780600
6	32.289520	3.287000	56	6.770140	2.739440
7	31.547420	3.287000	57	6.500600	2.698590
8	30.805330	3.287000	58	6.231610	2.658310
9	30.063230	3.287000	59	5.963290	2.618880
10	29.321140	3.287000	60	5.695780	2.580530
11	28.579040	3.287000	61	5.429210	2.543520
12	27.836950	3.287000	62	5.163700	2.508080
13	27.094850	3.287000	63	4.899380	2.474440
14	26.352750	3.287000	64	4.636340	2.442820
15	25.610660	3.287000	65	4.374700	2.413440
16	24.868560	3.287000	66	4.114540	2.386470
17	24.126470	3.287000	67	3.855970	2.362120
18	23.384370	3.287000	68	3.599060	2.340560
19	22.642280	3.287000	69	3.343880	2.321940
20	21.900180	3.287000	70	3.090500	2.306430
21	21.158090	3.287000	71	2.838960	2.294150
22	20.415990	3.287000	72	2.589360	2.285250
23	19.673900	3.287000	73	2.341690	2.279830
24	18.931800	3.287000	74	2.096000	2.278000
25	18.189700	3.287000	75	1.861240	2.284590
26	17.447610	3.287000	76	1.646690	2.302360
27	16.705510	3.287000	77	1.449000	2.329180
28	15.963420	3.287000	78	1.267340	2.363380
29	15.221320	3.287000	79	1.100870	2.403650
30	14.478680	3.287000	80	.948820	2.448900
31	13.659800	3.287000	81	.810460	2.498260
32	13.344080	3.287000	82	.685110	2.550980
33	12.914310	3.287000	83	.572180	2.606420
34	12.556160	3.287000	84	.471130	2.663990
35	12.257710	3.287000	85	.381470	2.723170
36	12.009300	3.287000	86	.302790	2.783410
37	11.762750	3.285150	87	.234670	2.844160
38	11.512400	3.279660	88	.174200	2.907700
39	11.260840	3.270630	89	.123580	2.971460
40	11.007410	3.258180	90	.082490	3.034880
41	10.752170	3.242450	91	.050510	3.097310
42	10.495180	3.223600	92	.024410	3.166540
43	10.236530	3.201760	93	.006470	3.243660
44	9.976300	3.177120	94	.000000	3.326000
45	9.714570	3.149860	95	.016300	3.410370
46	9.451440	3.120170	96	.063940	3.480560
47	9.167230	3.088250	97	.140960	3.544650
48	8.921440	3.054320	98	.233160	3.597890
49	8.654790	3.018610	99	.337440	3.644260
50	8.387710	2.981360	100	.449630	3.684830

POTENTIAL FLOW - - 2-D , 23Y RELEASE D-1-1 FLOW FIELD PLOTS

UNTRANSFORMED COORDINATE DATA FOR BODY ID = 2, 2-D OCSEE

I	X(I)	Y(I)	I	X(I)	Y(I)
101	.569370	3.721220	140	10.803840	3.960300
102	.696610	3.754320	141	11.105130	3.960300
103	.831460	3.784720	142	11.406420	3.960300
104	.974120	3.812740	143	11.707710	3.960300
105	1.124870	3.838600	144	12.009000	3.960300
106	1.284050	3.862400	145	12.309000	3.960300
107	1.452020	3.884150	146	12.669000	3.960300
108	1.629190	3.903780	147	13.101000	3.960300
109	1.815980	3.921170	148	13.619400	3.960300
110	2.012850	3.936050	149	14.241480	3.960300
111	2.220310	3.948060	150	14.987980	3.960300
112	2.438860	3.956570	151	15.738400	3.960300
113	2.669100	3.960300	152	16.488830	3.960300
114	2.970290	3.960300	153	17.239260	3.960300
115	3.271580	3.960300	154	17.989690	3.960300
116	3.572870	3.960300	155	18.740120	3.960300
117	3.874160	3.960300	156	19.490550	3.960300
118	4.175450	3.960300	157	20.240980	3.960300
119	4.476740	3.960300	158	20.991410	3.960300
120	4.778030	3.960300	159	21.741840	3.960300
121	5.079320	3.960300	160	22.492270	3.960300
122	5.380610	3.960300	161	23.242700	3.960300
123	5.681900	3.960300	162	23.993130	3.960300
124	5.983190	3.960300	163	24.743560	3.960300
125	6.284480	3.960300	164	25.493990	3.960300
126	6.585780	3.960300	165	26.244420	3.960300
127	6.887070	3.960300	166	26.994850	3.960300
128	7.188360	3.960300	167	27.745280	3.960300
129	7.489650	3.960300	168	28.495700	3.960300
130	7.790940	3.960300	169	29.246130	3.960300
131	8.092230	3.960300	170	29.996560	3.960300
132	8.393520	3.960300	171	30.746990	3.960300
133	8.694810	3.960300	172	31.497420	3.960300
134	8.996100	3.960300	173	32.247850	3.960300
135	9.297390	3.960300	174	32.998280	3.960300
136	9.598680	3.960300	175	33.748710	3.960300
137	9.899970	3.960300	176	34.499140	3.960300
138	10.201260	3.960300	177	35.249570	3.960300
139	10.502550	3.960300	178	36.000000	3.960300

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 2, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
1	36.000000	3.287000					
	35.628950	3.287000	.742100	.742100	.000000	-1.000000	.000000
2	35.257900	3.287000					
	34.886850	3.287000	.742100	.742100	.000000	-1.000000	.000000
3	34.515800	3.287000					
	34.144755	3.287000	.742090	.742090	.000000	-1.000000	.000000
4	33.773710	3.287000					
	33.402660	3.287000	.742100	.742100	.000000	-1.000000	.000000
5	33.031610	3.287000					
	32.660565	3.287000	.742090	.742090	.000000	-1.000000	.000000
6	32.289520	3.287000					
	31.918470	3.287000	.742100	.742100	.000000	-1.000000	.000000
7	31.547420	3.287000					
	31.176375	3.287000	.742090	.742090	.000000	-1.000000	.000000
8	30.805330	3.287000					
	30.434280	3.287000	.742100	.742100	.000000	-1.000000	.000000
9	30.063230	3.287000					
	29.692185	3.287000	.742090	.742090	.000000	-1.000000	.000000
10	29.321140	3.287000					
	28.950090	3.287000	.742100	.742100	.000000	-1.000000	.000000
11	28.579040	3.287000					
	28.207995	3.287000	.742090	.742090	.000000	-1.000000	.000000
12	27.836950	3.287000					
	27.465900	3.287000	.742100	.742100	.000000	-1.000000	.000000
13	27.094850	3.287000					
	26.723800	3.287000	.742100	.742100	.000000	-1.000000	.000000
14	26.352750	3.287000					
	25.981705	3.287000	.742090	.742090	.000000	-1.000000	.000000
15	25.610660	3.287000					
	25.239610	3.287000	.742100	.742100	.000000	-1.000000	.000000
16	24.868560	3.287000					
	24.497515	3.287000	.742090	.742090	.000000	-1.000000	.000000
17	24.126470	3.287000					
	23.755420	3.287000	.742100	.742100	.000000	-1.000000	.000000
18	23.384370	3.287000					
	23.013325	3.287000	.742090	.742090	.000000	-1.000000	.000000
19	22.642280	3.287000					
	22.271230	3.287000	.742100	.742100	.000000	-1.000000	.000000
20	21.900180	3.287000					
	21.529135	3.287000	.742090	.742090	.000000	-1.000000	.000000
21	21.158090	3.287000					
	20.787040	3.287000	.742100	.742100	.000000	-1.000000	.000000
22	20.415990	3.287000					
	20.044945	3.287000	.742090	.742090	.000000	-1.000000	.000000
23	19.673900	3.287000					
	19.302850	3.287000	.742100	.742100	.000000	-1.000000	.000000
24	18.931800	3.287000					
	18.560750	3.287000	.742100	.742100	.000000	-1.000000	.000000
25	18.189700	3.287000					

POTENTIAL FLOW - - 2-D , 23Y RELEASE D-1-1 FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 2, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
	17.818655	3.287000	.742090	.742090	.000000	-1.000000	.000000
26	17.447610	3.287000					
	17.076560	3.287000	.742100	.742100	.000000	-1.000000	.000000
27	16.705510	3.287000					
	16.334465	3.287000	.742090	.742090	.000000	-1.000000	.000000
28	15.963420	3.287000					
	15.592370	3.287000	.742100	.742100	.000000	-1.000000	.000000
29	15.221320	3.287000					
	14.850000	3.287000	.742640	.742640	.000000	-1.000000	.000000
30	14.478680	3.287000					
	14.169240	3.287000	.618880	.618880	.000000	-1.000000	.000000
31	13.859800	3.287000					
	13.601940	3.287000	.515720	.515720	.000000	-1.000000	.000000
32	13.344080	3.287000					
	13.129195	3.287000	.429770	.429770	.000000	-1.000000	.000000
33	12.914310	3.287000					
	12.735235	3.287000	.358150	.358150	.000000	-1.000000	.000000
34	12.556160	3.287000					
	12.406935	3.287000	.298450	.298450	.000000	-1.000000	.000000
35	12.257710	3.287000					
	12.133355	3.287000	.248710	.248710	.000000	-1.000000	.000000
36	12.009000	3.287000					
	11.885525	3.286075	.246957	.246957	-.007491	-.999972	.000000
37	11.762050	3.285150					
	11.637225	3.282405	.249710	.249710	-.021985	-.999758	.000000
38	11.512400	3.279660					
	11.386620	3.275145	.251722	.251722	-.035873	-.999356	.000000
39	11.260840	3.270630					
	11.134125	3.264405	.253736	.253736	-.049067	-.998796	.000000
40	11.007410	3.258180					
	10.879790	3.250315	.255724	.255724	-.061512	-.998106	.000000
41	10.752170	3.242450					
	10.623675	3.233025	.257680	.257680	-.073153	-.997321	.000000
42	10.495180	3.223600					
	10.365855	3.212680	.259570	.259570	-.084139	-.996454	.000000
43	10.236530	3.201760					
	10.106415	3.189440	.261394	.261394	-.094264	-.995547	.000000
44	9.976300	3.177120					
	9.845435	3.163490	.263146	.263146	-.103593	-.994620	.000000
45	9.714570	3.149860					
	9.583005	3.135015	.264800	.264800	-.112122	-.993694	.000000
46	9.451440	3.120170					
	9.319235	3.104210	.266330	.266330	-.119851	-.992792	.000000
47	9.187030	3.088250					
	9.054235	3.071285	.267749	.267749	-.126723	-.991938	.000000
48	8.921440	3.054320					
	8.788115	3.036465	.269030	.269030	-.132736	-.991151	.000000
49	8.654790	3.018610					
	8.521000	2.999985	.270160	.270160	-.137881	-.990449	.000000
50	8.387210	2.981360					

POTENTIAL FLOW - - 2-D, 23Y RELEASE G-1-B FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 2, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
51	8.253015 8.118820	2.962075 2.942790	.271147	.271147	-.142247	-.989831	.000000
52	7.984350 7.849780	2.922985 2.903180	.271940	.271940	-.145657	-.989335	.000000
53	7.714990 7.580200	2.882970 2.862760	.272593	.272593	-.148279	-.988946	.000000
54	7.445225 7.310250	2.842290 2.821820	.273037	.273037	-.149943	-.988695	.000000
55	7.175155 7.040060	2.801210 2.780600	.273316	.273316	-.150814	-.988562	.000000
56	6.905100 6.770140	2.760020 2.739440	.273040	.273040	-.150747	-.988572	.000000
57	6.635370 6.500600	2.719015 2.698590	.272618	.272618	-.149843	-.988710	.000000
58	6.366165 6.231610	2.678450 2.658310	.271989	.271989	-.148094	-.988973	.000000
59	6.097450 5.963290	2.638595 2.618880	.271202	.271202	-.145390	-.989374	.000000
60	5.829535 5.695780	2.599705 2.580530	.270245	.270245	-.141908	-.989880	.000000
61	5.562495 5.429210	2.562025 2.543520	.269127	.269127	-.137519	-.990499	.000000
62	5.296455 5.163700	2.525800 2.508080	.267865	.267865	-.132306	-.991209	.000000
63	5.031540 4.899380	2.491260 2.474440	.266452	.266452	-.126252	-.991998	.000000
64	4.767860 4.636340	2.458630 2.442820	.264934	.264934	-.119351	-.992852	.000000
65	4.505520 4.374700	2.428130 2.413440	.263284	.263284	-.111590	-.993754	.000000
66	4.244620 4.114540	2.399955 2.386470	.261554	.261554	-.103114	-.994670	.000000
67	3.985255 3.855970	2.374295 2.362120	.259714	.259714	-.093757	-.995595	.000000
68	3.727515 3.599060	2.351340 2.340560	.257813	.257813	-.083627	-.996497	.000000
69	3.471470 3.343880	2.331250 2.321940	.255858	.255858	-.072775	-.997348	.000000
70	3.217190 3.090500	2.314185 2.306430	.253854	.253854	-.061098	-.998132	.000000
71	2.964740 2.838980	2.300290 2.294150	.251820	.251820	-.048765	-.998810	.000000
72	2.714170 2.589360	2.289700 2.285250	.249779	.249779	-.035632	-.999365	.000000
73	2.465575 2.341690	2.282540 2.279830	.247729	.247729	-.021879	-.999761	.000000
74	2.218845 2.096000	2.278915 2.278000	.245697	.245697	-.007448	-.999972	.000000
75	1.978620 1.861240	2.281295 2.284590	.234852	.234852	.028060	-.999606	.000000

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 2, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
	1.753965	2.293475	.215285	.215285	.082542	-.996588	.000000
76	1.646690	2.302360					
	1.547845	2.315770	.199501	.199501	.134435	-.990922	.000000
77	1.449000	2.329180					
	1.358170	2.346280	.184851	.184851	.185014	-.982736	.000000
78	1.267340	2.363380					
	1.184105	2.383515	.171272	.171272	.235124	-.971965	.000000
79	1.100870	2.403650					
	1.024845	2.426275	.158640	.158640	.285237	-.958457	.000000
80	.948820	2.448900					
	.879640	2.473580	.146901	.146901	.336009	-.941859	.000000
81	.810460	2.498260					
	.747785	2.524620	.135985	.135985	.387689	-.921790	.000000
82	.685110	2.550980					
	.628645	2.578700	.125805	.125805	.440684	-.897662	.000000
83	.572180	2.606420					
	.521655	2.635205	.116299	.116299	.495018	-.868883	.000000
84	.471130	2.663990					
	.426300	2.693580	.107430	.107430	.550871	-.834590	.000000
85	.381470	2.723170					
	.342130	2.753290	.099093	.099093	.607914	-.794002	.000000
86	.302790	2.783410					
	.268730	2.813785	.091274	.091274	.665580	-.746326	.000000
87	.234670	2.844160					
	.204435	2.875930	.087715	.087715	.724390	-.689390	.000000
88	.174200	2.907700					
	.148890	2.939580	.081411	.081411	.783188	-.621785	.000000
89	.123580	2.971460					
	.103035	3.003170	.075568	.075568	.839247	-.543751	.000000
90	.082490	3.034880					
	.066500	3.066095	.070144	.070144	.890022	-.455917	.000000
91	.050510	3.097310					
	.037460	3.131925	.073986	.073986	.935711	-.352767	.000000
92	.024410	3.166540					
	.015440	3.205100	.079179	.079179	.973994	-.226575	.000000
93	.006470	3.243660					
	.003235	3.284830	.082594	.082594	.996927	-.078335	.000000
94	.000000	3.326000					
	.008150	3.368185	.085930	.085930	.981844	.189689	.000000
95	.016300	3.410370					
	.040120	3.445465	.084830	.084830	.827415	.561591	.000000
96	.063940	3.480560					
	.102450	3.512605	.100198	.100198	.639634	.768679	.000000
97	.140960	3.544650					
	.187060	3.571270	.106468	.106468	.500059	.865992	.000000
98	.233160	3.597890					
	.285370	3.621075	.114125	.114125	.406309	.913736	.000000
99	.337440	3.644260					
	.393535	3.664545	.119300	.119300	.340067	.940401	.000000
100	.449630	3.684830					

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 2, 2-D OCSEF

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
101	.509560 .569370	3.703025 3.721220	.125148	.125148	.290777	.956791	.000000
102	.632990 .696610	3.737770 3.754320	.131475	.131475	.251759	.967790	.000000
103	.764030 .831450	3.769520 3.784720	.138224	.138224	.219932	.975515	.000000
104	.902785 .974120	3.798730 3.812740	.145395	.145395	.192716	.981255	.000000
105	1.049495 1.124870	3.825670 3.838600	.152952	.152952	.169073	.985604	.000000
106	1.204460 1.284050	3.850500 3.862400	.160949	.160949	.147872	.989006	.000000
107	1.368035 1.452020	3.873275 3.884150	.169372	.169372	.128415	.991720	.000000
108	1.540605 1.629190	3.893965 3.903780	.178254	.178254	.110124	.993918	.000000
109	1.722585 1.815980	3.912475 3.921170	.187598	.187598	.092698	.995694	.000000
110	1.914415 2.012850	3.928610 3.936050	.197432	.197432	.075368	.997156	.000000
111	2.116580 2.220310	3.942055 3.948060	.207807	.207807	.057794	.998329	.000000
112	2.329585 2.438860	3.952315 3.956570	.218716	.218716	.038909	.999243	.000000
113	2.553930 2.669000	3.958435 3.960300	.230170	.230170	.016205	.999869	.000000
114	2.819645 2.970290	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000
115	3.120935 3.271580	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000
116	3.422225 3.572870	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000
117	3.723515 3.874160	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000
118	4.024805 4.175450	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000
119	4.326095 4.476740	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000
120	4.627385 4.778030	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000
121	4.928675 5.079320	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000
122	5.229965 5.380610	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000
123	5.531255 5.681900	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000
124	5.832545 5.983190	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000
125	6.133835 6.284480	3.960300 3.960300	.301290	.301290	.000000	1.000000	.000000

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

FLEMENT COORDINATE DATA FOR BODY ID = 2, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
	6.435130	3.960300	.301300	.301300	.000000	1.000000	.000000
126	6.585780	3.960300					
	6.736425	3.960300	.301290	.301290	.000000	1.000000	.000000
127	6.887070	3.960300					
	7.037715	3.960300	.301290	.301290	.000000	1.000000	.000000
128	7.188360	3.960300					
	7.339005	3.960300	.301290	.301290	.000000	1.000000	.000000
129	7.489650	3.960300					
	7.640295	3.960300	.301290	.301290	.000000	1.000000	.000000
130	7.790940	3.960300					
	7.941585	3.960300	.301290	.301290	.000000	1.000000	.000000
131	8.092230	3.960300					
	8.242875	3.960300	.301290	.301290	.000000	1.000000	.000000
132	8.393520	3.960300					
	8.544165	3.960300	.301290	.301290	.000000	1.000000	.000000
133	8.694810	3.960300					
	8.845455	3.960300	.301290	.301290	.000000	1.000000	.000000
134	8.996100	3.960300					
	9.146745	3.960300	.301290	.301290	.000000	1.000000	.000000
135	9.297390	3.960300					
	9.448035	3.960300	.301290	.301290	.000000	1.000000	.000000
136	9.598680	3.960300					
	9.749325	3.960300	.301290	.301290	.000000	1.000000	.000000
137	9.899970	3.960300					
	10.050615	3.960300	.301290	.301290	.000000	1.000000	.000000
138	10.201260	3.960300					
	10.351905	3.960300	.301290	.301290	.000000	1.000000	.000000
139	10.502550	3.960300					
	10.653195	3.960300	.301290	.301290	.000000	1.000000	.000000
140	10.803840	3.960300					
	10. 4485	3.960300	.301290	.301290	.000000	1.000000	.000000
141	11. 5130	3.960300					
	11. 5775	3.960300	.301290	.301290	.000000	1.000000	.000000
142	11. 6420	3.960300					
	11.557065	3.960300	.301290	.301290	.000000	1.000000	.000000
143	11.707710	3.960300					
	11.858355	3.960300	.301290	.301290	.000000	1.000000	.000000
144	12.009000	3.960300					
	12.159000	3.960300	.300000	.300000	.000000	1.000000	.000000
145	12.309000	3.960300					
	12.489000	3.960300	.360000	.360000	.000000	1.000000	.000000
146	12.669000	3.960300					
	12.885000	3.960300	.432000	.432000	.000000	1.000000	.000000
147	13.101000	3.960300					
	13.360200	3.960300	.518400	.518400	.000000	1.000000	.000000
148	13.619400	3.960300					
	13.930440	3.960300	.622080	.622080	.000000	1.000000	.000000
149	14.241480	3.960300					
	14.614730	3.960300	.746500	.746500	.000000	1.000000	.000000
150	14.987980	3.960300					

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 2, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
151	15.363190 15.738400	3.960300 3.960300	.750420	.750420	.000000	1.000000	.000000
152	16.113615 16.488830	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
153	16.864045 17.239260	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
154	17.614475 17.989690	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
155	18.364905 18.740120	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
156	19.115335 19.490550	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
157	19.865765 20.240980	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
158	20.616195 20.991410	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
159	21.366625 21.741840	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
160	22.117055 22.492270	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
161	22.867485 23.242700	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
162	23.6179 23.9931	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
163	24.3683 24.7435	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
164	25.118775 25.493990	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
165	25.869205 26.244420	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
166	26.619635 26.994850	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
167	27.3700 27.7452	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
168	28.1204 28.4957	3.960300 3.960300	.750420	.750420	.000000	1.000000	.000000
169	28.8709 29.2461	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
170	29.6213 29.9965	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
171	30.371775 30.746990	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
172	31.122205 31.497420	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
173	31.872635 32.247850	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
174	32.623065 32.998280	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000
175	33.373495 33.748710	3.960300 3.960300	.750430	.750430	.000000	1.000000	.000000

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POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

ELEMENT COORDINATE DATA FOR BODY ID = 2, 2-D OCSEE

I	X(I)	Y(I)	DL	DS	SIN(ALF)	COS(ALF)	CURVATURE
	34.123925	3.960300	.750430	.750430	.000000	1.000000	.000000
176	34.499140	3.960300					
	34.874355	3.961300	.750430	.750430	.000000	1.000000	.000000
177	35.249570	3.960300					
	35.624785	3.960300	.750430	.750430	.000000	1.000000	.000000
178	36.000000	3.960300					

SUMDS = 72.688405

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1, FLOW FIELD PLOTS

BODY GEOMETRY SUMMARY

BODY DESCRIPTION	BODY ID	LIFT TYPE	N/O	SID	TFORM	NORM	CHORD	TYPE	SIGMA F	SIGMA C	SIGMA S	SIGMA C	ELEMENT STORAGE N/O	ELEMENT STORAGE FIRST	ELEMENT STORAGE NO.
2-D QCSEE	1	YES	NEW		NO	NO	.000000	L	0	0	0	0	NEW	1	177
2-D QCSEF	2	YES	NEW		NO	NO	.000000	L	0	0	0	0	NEW	178	177

TOTAL NUMBER OF BODIES = 2

TOTAL NUMBER OF ELEMENTS = 354

ELFORM COMPLETE, CALL MAFORM, T = .000SECONDS.

POTENTIAL FLOW - - 2-D ,   23Y RELEASE 0-1-1 FLOW FIELD PLOTS

VORTICITY WEIGHTING FUNCTION = S/L*(1 - S/L)

.005135	.015246	.025144	.034828	.044299	.053557
.062602	.071434	.080053	.088458	.096650	.104629
.112395	.119948	.127288	.134414	.141327	.148027
.154514	.160788	.166849	.172696	.178330	.183752
.188959	.193954	.198736	.203304	.207648	.211434
.214454	.216876	.218830	.220412	.221818	.223192
.224533	.225838	.227110	.228347	.229549	.230718
.231852	.232951	.234017	.235047	.236044	.237006
.237934	.238827	.239686	.240511	.241301	.242057
.242779	.243466	.244119	.244738	.245322	.245872
.246387	.246868	.247315	.247727	.248105	.248410
.248647	.248854	.249035	.249193	.249329	.249448
.249549	.249636	.249710	.249773	.249825	.249869
.249905	.249933	.249956	.249973	.249984	.249992
.249997	.250000	.250000	.249998	.249994	.249987
.249977	.249964	.249946	.249923	.249894	.249857
.249811	.249754	.249683	.249597	.249493	.249367
.249215	.249032	.248815	.248570	.248300	.248003
.247680	.247330	.246953	.246547	.246113	.245650
.245157	.244635	.244083	.243501	.242889	.242247
.241575	.240874	.240142	.239382	.238593	.237777
.236935	.236067	.235174	.234257	.233317	.232355
.231371	.230366	.229342	.228299	.227238	.226160
.225066	.223956	.222830	.221692	.220534	.219227
.217622	.215642	.213189	.210133	.206306	.201932
.197351	.192561	.187564	.182357	.176943	.171320
.165488	.159448	.153199	.146742	.140077	.133203
.126120	.118830	.111330	.103623	.095706	.087582
.079249	.070707	.061957	.052998	.043832	.034456
.024872	.015080	.005079			

POTENTIAL FLOW - - 2-E , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

VORTICITY WEIGHTING FUNCTION = S/L*(1 - S/L)

.005079	.015079	.024872	.034456	.043831	.052998
.061957	.070707	.079248	.087581	.095706	.103622
.111330	.118829	.126120	.133203	.140077	.146742
.153199	.159448	.165488	.171319	.176943	.182357
.167564	.192561	.197351	.201932	.206306	.210133
.213189	.215642	.217622	.219227	.220533	.221692
.222830	.223955	.225066	.226160	.227238	.228299
.229342	.230366	.231371	.232355	.233317	.234257
.235174	.236067	.236935	.237777	.238593	.239382
.240142	.240874	.241575	.242247	.242889	.243501
.244083	.244635	.245157	.245650	.246113	.246547
.246953	.247330	.247680	.248003	.248300	.248570
.248815	.249032	.249215	.249367	.249493	.249597
.249683	.249754	.249811	.249857	.249894	.249923
.249946	.249964	.249977	.249987	.249994	.249998
.250000	.250000	.249997	.249992	.249984	.249973
.249956	.249933	.249905	.249869	.249825	.249773
.249710	.249636	.249549	.249448	.249329	.249193
.249035	.248854	.248647	.248410	.248105	.247727
.247315	.246868	.246387	.245872	.245322	.244738
.244119	.243466	.242779	.242057	.241302	.240511
.239686	.238877	.237934	.237006	.236044	.235047
.234017	.232951	.231852	.230718	.229550	.228347
.227110	.225838	.224533	.223193	.221818	.220412
.218830	.216876	.214454	.211434	.207648	.203304
.198736	.193954	.188959	.183752	.178336	.172696
.166849	.160788	.154514	.148028	.141327	.134414
.127288	.119948	.112395	.104629	.096650	.088458
.080053	.071434	.062603	.053558	.044299	.034828
.025144	.015246	.005135			

MAFOPH COMPLETE, CALL SOLVE, T = .000SECONDS.

SOLVIT TIME = .000 SECONDS.

THE 354 X 354 MATRIX WITH 4 RIGHT SIDES WAS SOLVED DIRECTLY IN .000 MINUTES.

SOLVIT TIME = .000 SECONDS.

SOLVE COMPLETE, READ FLOW TITLE + CONTROL CARD, CALL COMBO, T = .000SECONDS.

ON RETURN FROM MIS1, NERR = 0

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POTENTIAL FLOW - - 2-D ,   23Y RELEASE D-1-1  FLOW FIELD PLOTS

 COMBINATION CONSTANTS

      ALPHA  =            C                 90               .000000

              1               .017023           .457723           .017023

              2              -.017023           .457724          -.017023


 LIFT CURVE CONSTANTS

      RK1 =      .000000  RK2 =    11.090788  RK3 =      .000000

      ALPHA0 =      .000003

      ALPHA  =      .000000

      CLT    =      .000013

 COMBO COMPLETE, CALL FLOWS, T =      .000SECONDS.
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POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NUMBER 1

PT.NO.	VN	VT	SIGMA
1	-.000000	-1.028939	.017604
2	-.000000	-1.017134	.025033
3	-.000000	-1.013142	.031440
4	-.000000	-1.010961	.037367
5	-.000000	-1.009585	.043035
6	-.000000	-1.008648	.048551
7	-.000000	-1.007983	.053968
8	-.000000	-1.007504	.059320
9	-.000000	-1.007158	.064627
10	-.000000	-1.006913	.069902
11	-.000000	-1.006748	.075156
12	-.000000	-1.006646	.080397
13	-.000000	-1.006587	.085630
14	-.000000	-1.006597	.090861
15	-.000000	-1.006675	.096094
16	-.000000	-1.006702	.101332
17	-.000000	-1.006828	.106580
18	-.000000	-1.006975	.111840
19	-.000000	-1.007142	.117116
20	-.000000	-1.007371	.122412
21	-.000000	-1.007619	.127731
22	-.000000	-1.007889	.133077
23	-.000001	-1.008207	.138453
24	-.000000	-1.008566	.143866
25	-.000000	-1.008964	.149317
26	-.000000	-1.009398	.154815
27	-.000001	-1.009815	.160365
28	-.000001	-1.010299	.165977
29	-.000001	-1.010563	.171649
30	-.000001	-1.013049	.177026
31	-.000001	-1.014866	.181713
32	-.000001	-1.016373	.185817
33	-.000001	-1.017760	.189410
34	-.000001	-1.019399	.192433
35	-.000001	-1.020229	.194910
36	-.000001	-1.022106	.196650
37	-.000001	-1.024473	.197240
38	-.000001	-1.026886	.196531
39	-.000001	-1.029261	.194549
40	-.000001	-1.031412	.191416
41	-.000001	-1.033370	.187296
42	-.000001	-1.035129	.182367
43	-.000001	-1.036660	.176800
44	-.000001	-1.038101	.170749
45	-.000001	-1.039363	.164352
46	-.000001	-1.040586	.157723
47	-.000001	-1.041802	.150955
48	-.000001	-1.042986	.144122
49	-.000001	-1.044232	.137280
50	-.000001	-1.045503	.130467
51	-.000001	-1.046951	.123718
52	-.000000	-1.048456	.117049
53	-.000000	-1.050169	.119475
54	-.000000	-1.052061	.104000

POTENTIAL FLOW - - 2-D ,   23Y RELEASE 0-1-1   FLOW FIELD PLOTS

55	-.000000	-1.054201	.097628
56	-.000000	-1.056650	.091357
57	-.000000	-1.059446	.085182
58	-.000000	-1.062685	.079095
59	-.000000	-1.066521	.073084
60	-.000000	-1.071090	.067132
61	-.000000	-1.076668	.061220
62	-.000000	-1.083655	.055315
63	-.000000	-1.092768	.049368
64	-.000000	-1.105541	.043303
65	-.000000	-1.127428	.036946
66	-.000000	-1.146574	.034096
67	-.000000	-1.158263	.033594
68	-.000000	-1.164203	.032722
69	-.000000	-1.168313	.031732
70	-.000000	-1.171433	.030753
71	-.000000	-1.174023	.029801
72	-.000000	-1.176226	.028977
73	-.000000	-1.178099	.028294
74	-.000000	-1.179694	.027801
75	-.000000	-1.181016	.027560
76	-.000000	-1.181785	.027689
77	-.000000	-1.181818	.028246
78	-.000000	-1.180365	.029519
79	-.000000	-1.176067	.031787
80	-.000000	-1.165318	.035839
81	-.000000	-1.139250	.043076
82	-.000000	-1.066648	.056895
83	-.000000	-.883540	.080265
84	-.000000	-.469298	.111408
85	-.000000	-.071968	.120359
86	-.000000	.206345	.120556
87	-.000000	.435827	.116030
88	-.000000	.617725	.109918
89	-.000000	.769241	.103417
90	-.000000	.904231	.095888
91	-.000000	1.021464	.087816
92	-.000000	1.121053	.079483
93	.000000	1.204016	.071306
94	-.000000	1.275528	.063040
95	-.000000	1.336625	.054766
96	-.000000	1.388660	.046521
97	-.000000	1.432809	.038234
98	-.000000	1.469863	.029888
99	-.000000	1.500415	.021373
100	-.000000	1.524594	.012614
101	-.000000	1.541987	.003425
102	-.000000	1.551225	-.006353
103	-.000000	1.549216	-.017014
104	.000000	1.524991	-.029137
105	.000000	1.486527	-.037708
106	.000000	1.456704	-.042041
107	.000000	1.436392	-.046635
108	.000000	1.418850	-.051492
109	.000000	1.402057	-.056533
110	.000000	1.385084	-.061754
111	.000000	1.367562	-.067090

POTENTIAL FLOW - - 2-D , 23Y RELEASE D-1-1 FLOW FIELD PLOTS

112	.000000	1.349306	-.072537
113	.000000	1.330236	-.078068
114	.000000	1.310511	-.083641
115	.000000	1.290132	-.089280
116	.000000	1.269211	-.094956
117	.000000	1.247967	-.100662
118	.000000	1.226507	-.106402
119	.000000	1.204921	-.112181
120	.000000	1.183450	-.117983
121	.000000	1.162103	-.123835
122	.000000	1.141098	-.129703
123	.000000	1.120532	-.135604
124	.000000	1.100455	-.141535
125	.000000	1.081056	-.147464
126	.000000	1.062325	-.153392
127	.000000	1.044465	-.159267
128	.000000	1.027421	-.165087
129	.000000	1.011404	-.170776
130	.000000	.996361	-.176304
131	.000000	.982416	-.181604
132	.000000	.969582	-.186596
133	.000000	.957995	-.191181
134	.000000	.947711	-.195271
135	.000000	.938751	-.198761
136	.000000	.931223	-.201532
137	.000000	.925368	-.203456
138	.000000	.921057	-.204460
139	.000001	.918648	-.204425
140	.000000	.918525	-.203259
141	.000001	.921513	-.200866
142	.000000	.931033	-.196964
143	.000000	.940086	-.193005
144	.000000	.945235	-.189996
145	.000000	.949876	-.186954
146	.000000	.953665	-.183546
147	.000000	.956832	-.179627
148	.000000	.959568	-.175099
149	.000000	.962316	-.169872
150	.000000	.962312	-.164276
151	.000001	.962352	-.158748
152	.000000	.962355	-.153276
153	.000001	.962346	-.147851
154	.000000	.962289	-.142470
155	.000001	.962253	-.137126
156	.000000	.962205	-.131815
157	.000000	.962172	-.126534
158	.000001	.962139	-.121279
159	.000000	.962107	-.116045
160	.000000	.962068	-.110829
161	.000000	.962043	-.105629
162	.000000	.962005	-.100439
163	.000000	.961991	-.095258
164	.000000	.961993	-.090082
165	.000000	.961976	-.084908
166	.000001	.961989	-.079730
167	.000000	.961985	-.074543
168	.000000	.961998	-.069342

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIFLD PLOTS

169	.000000	.962026	-.064119
170	.000000	.962032	-.058864
171	.000000	.962044	-.053562
172	.000000	.961999	-.048193
173	.000000	.961873	-.042725
174	.000000	.961499	-.037102
175	.000000	.960577	-.031221
176	.000000	.958078	-.024860
177	.000000	.948073	-.017482
178	.000000	-.948073	-.017482
179	.000000	-.958078	-.024860
180	.000000	-.960577	-.031221
181	.000000	-.961499	-.037102
182	.000000	-.961873	-.042725
183	.000000	-.961999	-.048193
184	.000000	-.962044	-.053561
185	.000000	-.962032	-.058863
186	.000000	-.962025	-.064118
187	.000000	-.961998	-.069342
188	.000000	-.961985	-.074542
189	.000000	-.961988	-.079729
190	-.000000	-.961976	-.084907
191	-.000000	-.961993	-.090082
192	-.000000	-.961991	-.095257
193	.000000	-.962005	-.100438
194	.000000	-.962043	-.105628
195	.000000	-.962068	-.110829
196	.000000	-.962106	-.116044
197	.000000	-.962139	-.121278
198	.000000	-.962172	-.126533
199	.000000	-.962205	-.131815
200	.000000	-.962253	-.137125
201	.000000	-.962289	-.142469
202	.000000	-.962346	-.147850
203	.000000	-.962355	-.153275
204	.000000	-.962352	-.158747
205	.000000	-.962312	-.164275
206	-.000000	-.962316	-.169871
207	-.000000	-.959568	-.175098
208	-.000000	-.956832	-.179626
209	-.000000	-.953665	-.183545
210	-.000000	-.949876	-.186953
211	.000000	-.945235	-.189996
212	-.000000	-.940085	-.193005
213	-.000000	-.931033	-.196963
214	-.000000	-.921513	-.200865
215	.000000	-.918575	-.203258
216	.000000	-.918649	-.204424
217	-.000000	-.921057	-.204459
218	.000000	-.925368	-.203456
219	-.000000	-.931223	-.201531
220	.000000	-.938751	-.198760
221	-.000000	-.947712	-.195271
222	-.000000	-.957995	-.191181
223	.000000	-.969582	-.186595
224	.000000	-.982416	-.181604
225	.000000	-.996362	-.176304

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

226	.000000	-1.011405	-.170775
227	.000000	-1.027421	-.165086
228	.000001	-1.044465	-.159266
229	.000000	-1.067326	-.153391
[illegible]	.000001	-1.081056	-.147464
[illegible]	.000000	-1.100456	-.141534
[illegible]	.000001	-1.120532	-.135603
[illegible]	.000001	-1.141098	-.129703
234	.000000	-1.162103	-.123834
235	.000000	-1.183450	-.117982
236	.000000	-1.204921	-.112181
237	.000000	-1.226507	-.106401
238	.000000	-1.247967	-.100662
239	.000000	-1.269211	-.094955
240	.000000	-1.290132	-.089280
241	.000000	-1.310510	-.083640
242	.000000	-1.330235	-.078068
243	.000000	-1.349306	-.072537
244	.000000	-1.367562	-.067090
245	.000000	-1.385084	-.061754
246	.000000	-1.402057	-.056533
247	.000000	-1.418850	-.051492
248	.000000	-1.436392	-.046635
249	.000000	-1.456704	-.042041
250	.000000	-1.486527	-.037707
251	.000000	-1.524991	-.029137
252	.000000	-1.549216	-.017014
253	.000000	-1.551224	-.006352
254	.000000	-1.541987	.003425
255	.000000	-1.524594	.012614
256	.000000	-1.500415	.021374
257	.000000	-1.469862	.029889
258	.000000	-1.432809	.038235
259	.000000	-1.388660	.046521
260	-.000000	-1.336624	.054766
261	-.000000	-1.275527	.063040
262	-.000000	-1.204016	.071306
263	-.000000	-1.121052	.079483
264	-.000000	-1.021464	.087816
265	-.000000	-.904230	.095888
266	-.000000	-.769240	.103417
267	-.000001	-.617723	.109918
268	-.000000	-.435826	.116030
269	-.000001	-.206343	.120556
270	-.000001	.071970	.120359
271	-.000001	.469300	.111408
272	-.000000	.883542	.080265
273	-.000000	1.066650	.056895
274	-.000000	1.139251	.043076
275	-.000000	1.165320	.035839
276	-.000000	1.176069	.031786
277	-.000000	1.180366	.029519
278	-.000000	1.181819	.028246
279	-.000000	1.181796	.027689
280	-.000000	1.181017	.027566
281	-.000000	1.179695	.027801
282	-.000000	1.178100	.028294

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

283	-.000000	1.176277	.028977
284	-.000000	1.174024	.029801
285	-.000000	1.171433	.030753
286	-.000000	1.168314	.031732
287	-.000000	1.164204	.032722
288	-.000000	1.158263	.033594
289	-.000000	1.146575	.034095
290	-.000000	1.127428	.036946
291	-.000000	1.105542	.043303
292	-.000000	1.092769	.049368
293	-.000000	1.083655	.055315
294	-.000000	1.076668	.061220
295	-.000000	1.071090	.067132
296	-.000000	1.066521	.073084
297	-.000000	1.062686	.079095
298	-.000001	1.059446	.085182
299	-.000001	1.056650	.091357
300	-.000001	1.054201	.097628
301	-.000001	1.052061	.104000
302	-.000001	1.050170	.110474
303	-.000001	1.048456	.117049
304	-.000001	1.046951	.123717
305	-.000001	1.045503	.130466
306	-.000001	1.044233	.137279
307	-.000001	1.042986	.144121
308	-.000001	1.041802	.150955
309	-.000001	1.040586	.157722
310	-.000001	1.039363	.164351
311	-.000001	1.038101	.170749
312	-.000001	1.036660	.176800
313	-.000001	1.035129	.182366
314	-.000001	1.033370	.187296
315	-.000001	1.031412	.191415
316	-.000001	1.029261	.194548
317	-.000001	1.026886	.196530
318	-.000001	1.024473	.197240
319	-.000001	1.022107	.196649
320	-.000001	1.020229	.194909
321	-.000001	1.019399	.192432
322	-.000001	1.017760	.189409
323	-.000001	1.016374	.185816
324	-.000001	1.014866	.181713
325	-.000001	1.013049	.177025
326	-.000001	1.010563	.171649
327	-.000001	1.010299	.165976
328	-.000001	1.009816	.160365
329	-.000001	1.009398	.154814
330	-.000001	1.008964	.149316
331	-.000001	1.008566	.143865
332	-.000001	1.008207	.138452
333	-.000001	1.007889	.133076
334	-.000001	1.007619	.127730
335	-.000001	1.007371	.122411
336	-.000001	1.007142	.117115
337	-.000001	1.006974	.111639
338	-.000001	1.006828	.106579
339	-.000001	1.006702	.101331

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

340	-.000001	1.006625	.096093
341	-.000001	1.006597	.090860
342	-.000001	1.006587	.085629
343	-.000001	1.006646	.080396
344	-.000001	1.006747	.075156
345	-.000001	1.006912	.069901
346	-.000001	1.007157	.064626
347	-.000001	1.007504	.059319
348	-.000001	1.007982	.053967
349	-.000 0	1.008647	.048550
350	-.000 0	1.009585	.043035
351	-.000 0	1.010961	.037366
352	-.000 0	1.013141	.031439
353	-.000 0	1.017133	.025033
354	-.000 0	1.028938	.017604

POTENTIAL FLOW - - 2-D ,   23Y RELEASE 0-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NUMBER 2

PT.NO.	VN	VT	SIGMA
1	.000002	-2.549278	1.060326
2	.000004	-1.682437	1.403896
3	.000005	-1.351711	1.647885
4	.000005	-1.149978	1.835504
5	.000004	-1.005758	1.986534
6	.000006	-.893086	2.111722
7	.000006	-.800092	2.217672
8	.000005	-.720486	2.308757
9	.000005	-.650612	2.387992
10	.000005	-.587991	2.457532
11	.000003	-.531049	2.518931
12	.000007	-.478626	2.573336
13	.000007	-.429676	2.621601
14	.000007	-.384096	2.664372
15	.000009	-.340654	2.702145
16	.000008	-.299490	2.735302
17	.000008	-.260275	2.764131
18	.000007	-.222261	2.788871
19	.000007	-.185231	2.809686
20	.000007	-.149624	2.826764
21	.000006	-.114565	2.840201
22	.000006	-.080245	2.850097
23	.000005	-.046086	2.856453
24	.000006	-.012358	2.859340
25	.000004	.021881	2.858756
26	.000005	.055616	2.854713
27	.000004	.090431	2.847159
28	.000006	.123952	2.835993
29	.000005	.157749	2.821380
30	.000002	.196638	2.804530
31	.000004	.230684	2.787761
32	.000003	.260518	2.771530
33	.000004	.284378	2.755449
34	.000002	.302632	2.737727
35	.000003	.303657	2.713357
36	.000002	.299307	2.675980
37	.000001	.295255	2.622961
38	.000002	.295097	2.555090
39	.000001	.300101	2.475083
40	-.000000	.309956	2.385979
41	-.000000	.324495	2.290915
42	.000001	.343636	2.192633
43	.000000	.366313	2.093382
44	.000001	.391709	1.995054
45	-.000000	.419851	1.898975
46	.000000	.449624	1.806246
47	-.000000	.481026	1.717573
48	-.000001	.514052	1.633301
49	-.000000	.547709	1.553709
50	-.000000	.583211	1.478795
51	.000000	.618632	1.408585
52	-.000001	.656312	1.342887
53	-.000001	.694698	1.281520
54	-.000001	.734831	1.224246

POTENTIAL FLOW - - 2-D. 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

55	-.000000	.776630	1.170813
56	.000000	.820177	1.120955
57	-.000000	.866353	1.074383
58	-.000000	.915456	1.030815
59	.000000	.967491	.989944
60	.000000	1.023743	.951459
61	.000000	1.084840	.915046
62	.000000	1.152031	.880311
63	.000000	1.226970	.846735
64	-.0 0	1.311367	.813447
65	-.0 0	1.398413	.777822
66	.0 1	1.558176	.741949
67	.0 1	1.685705	.716232
68	-.000000	1.794103	.697150
69	.000001	1.906004	.680930
70	.000000	2.025253	.666628
71	.000000	2.153399	.653809
72	.000001	2.294158	.642027
73	.000001	2.449633	.631092
74	.000000	2.624191	.620638
75	.000000	2.822878	.610307
76	.000000	3.053728	.599612
77	.000000	3.326179	.588031
78	.000000	3.658453	.574325
79	.000001	4.075058	.556845
80	.000001	4.622932	.531528
81	.000001	5.368721	.489036
82	.000001	6.383450	.406851
83	.000001	7.527764	.228064
84	.000002	7.675782	-.084415
85	.000002	6.903519	-.240811
86	.000002	6.260056	-.289418
87	.000002	5.787414	-.333797
88	.000002	5.375353	-.371302
89	.000002	4.971159	-.405375
90	.000002	4.564025	-.435665
91	.000002	4.163982	-.461961
92	.000002	3.787869	-.483682
93	.000002	3.432995	-.502698
94	.000002	3.094938	-.519121
95	.000003	2.776009	-.533436
96	.000002	2.477319	-.546015
97	.000002	2.197728	-.557381
98	.000002	1.937174	-.567871
99	.000002	1.694007	-.578020
100	.000003	1.467786	-.588247
101	.000002	1.256716	-.599270
102	.000003	1.059364	-.612067
103	.000003	.871763	-.628367
104	.000003	.667172	-.653188
105	.000003	.512204	-.683564
106	.000003	.427535	-.711523
107	.000004	.346872	-.736102
108	.000003	.278631	-.760380
109	.000004	.221786	-.785311
110	.000003	.173867	-.811347
111	.000004	.133864	-.838817

POTENTIAL FLOW - - 2-D , 23Y RELEASE D-1-1 FLOW FIELD PLOTS

112	.000003	.099924	-.867904
113	.000004	.070970	-.898842
114	.000004	.046600	-.931758
115	.000004	.025191	-.966843
116	.000004	.096361	-1.004342
117	.000004	-.009787	-1.044371
118	.000005	-.024293	-1.087154
119	.000005	-.037857	-1.132905
120	.000005	-.049800	-1.181791
121	.000005	-.061331	-1.234018
122	.000007	-.071873	-1.289773
123	.000004	-.081933	-1.349217
124	.000004	-.091688	-1.412513
125	.000006	-.100440	-1.479726
126	.000005	-.109226	-1.550865
127	.000006	-.117527	-1.625959
128	.000006	-.125064	-1.704793
129	.000004	-.131214	-1.787218
130	.000006	-.137410	-1.872813
131	.000007	-.141564	-1.961123
132	.000009	-.143757	-2.051375
133	.000008	-.144643	-2.142707
134	.000010	-.142725	-2.233865
135	.000009	-.138030	-2.323480
136	.000012	-.130967	-2.409998
137	.000010	-.118261	-2.491466
138	.000010	-.102887	-2.565913
139	.000011	-.082972	-2.631418
140	.000010	-.056866	-2.685519
141	.000011	-.021305	-2.725570
142	.000009	.048392	-2.746130
143	.000003	.066151	-2.750302
144	.000005	.022218	-2.754711
145	.000007	.007156	-2.765630
146	.000005	-.001820	-2.779071
147	.000008	-.008548	-2.793923
148	.000002	-.013598	-2.809489
149	.000007	-.017764	-2.825000
150	.000007	-.017892	-2.838416
151	.000009	-.008979	-2.848340
152	.000007	-.004813	-2.854829
153	.000005	-.000814	-2.857888
154	.000004	.003083	-2.857539
155	.000008	.007979	-2.853820
156	.000010	.012047	-2.846676
157	.000010	.016489	-2.836070
158	.000009	.020476	-2.821948
159	.000006	.024926	-2.804284
160	.000007	.028781	-2.782897
161	.000004	.032716	-2.757652
162	.000006	.035822	-2.728358
163	-.000001	.038847	-2.694791
164	.000006	.041117	-2.656653
165	.000014	.041701	-2.613563
166	.000009	.040848	-2.565028
167	.000008	.036816	-2.510407
168	.000007	.028996	-2.448850

POTENTIAL FLOW - - 2-D , 23Y RELEASE C-1-1 FLOW FIELD PLOTS

169	.000011	.015505	-2.379230
170	.000009	-.006808	-2.299991
171	.000010	-.040943	-2.209020
172	.000008	-.093389	-2.103334
173	.000001	-.172060	-1.978612
174	.000000	-.292458	-1.828318
175	-.000000	-.482619	-1.641827
176	.000001	-.818638	-1.399587
177	.000007	-1.714709	-1.059353
178	.000002	-1.714773	1.059369
179	.000005	-.818690	1.399608
180	.000006	-.482670	1.641852
181	.000005	-.292507	1.828348
182	.000004	-.172109	1.978645
183	.000004	-.093437	2.103371
184	.000002	-.040985	2.209361
185	.000003	-.006846	2.300035
186	.000002	.015471	2.379276
187	.000001	.028963	2.448900
188	.000009	.036784	2.510459
189	.000010	.040816	2.565084
190	.000010	.041672	2.613622
191	.000010	.041093	2.656715
192	.000009	.038825	2.694854
193	.000010	.035802	2.728424
194	.000009	.032697	2.757719
195	.000010	.028765	2.782967
196	.000008	.024913	2.804356
197	.000008	.020468	2.822022
198	.000007	.016484	2.836145
199	.000007	.012047	2.846751
200	.000007	.007982	2.853896
201	.000005	.003086	2.857614
202	.000008	-.000808	2.857964
203	.000007	-.004805	2.854905
204	.000009	-.008965	2.848417
205	.000008	-.012874	2.838491
206	.000010	-.017743	2.825074
207	.000008	-.013576	2.809562
208	.000008	-.009524	2.793996
209	.000007	-.001793	2.779142
210	.000007	.007184	2.765700
211	.000008	.022251	2.754781
212	.000007	.066182	2.750371
213	.000005	.048424	2.746198
214	.000005	-.021272	2.725637
215	.000002	-.056834	2.685585
216	-.000032	-.082940	2.631482
217	-.000001	-.102854	2.565975
218	-.000003	-.118228	2.491526
219	-.000001	-.130935	2.410056
220	-.000003	-.137995	2.323535
221	-.000002	-.142690	2.233918
222	-.000002	-.144606	2.142757
223	-.000004	-.143720	2.051423
224	-.000003	-.141525	1.961168
225	-.000003	-.137371	1.872855

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POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

226	-.000004	-.131173	1.787258
227	-.000004	-.125025	1.704831
228	-.000004	-.117486	1.625994
229	-.000004	-.109184	1.550899
230	-.000004	-.100399	1.479758
231	-.000004	-.091645	1.412543
232	-.000005	-.081889	1.349245
233	-.000005	-.071828	1.289800
234	-.000005	-.061284	1.234043
235	-.000004	-.049751	1.181815
236	-.000004	-.037808	1.132927
237	-.000004	-.024243	1.087175
238	-.000004	-.009736	1.044391
239	-.000005	.006413	1.004360
240	-.000004	.025244	.966861
241	-.000004	.046654	.931775
242	-.000004	.071023	.898858
243	-.000004	.099978	.867919
244	-.000004	.133920	.838831
245	-.000004	.173923	.811360
246	-.000004	.221842	.785323
247	-.000003	.278687	.760392
248	-.000003	.346931	.736113
249	-.000003	.427594	.711534
250	-.000003	.512264	.683574
251	-.000001	.667234	.653197
252	-.000001	.871828	.628375
253	-.000001	1.059430	.612074
254	-.000001	1.256782	.599277
255	-.000000	1.467853	.588253
256	-.000001	1.694074	.578026
257	-.000001	1.937243	.567876
258	-.000001	2.197797	.557386
259	-.000001	2.477388	.546019
260	-.000001	2.776078	.533440
261	-.000001	3.095009	.519125
262	-.000001	3.433066	.502701
263	-.000002	3.787941	.483684
264	-.000001	4.164053	.461963
265	-.000002	4.564097	.435666
266	-.000002	4.971230	.405376
267	-.000002	5.375424	.371302
268	-.000002	5.787484	.333797
269	-.000003	6.260176	.289417
270	-.000002	6.903588	.240810
271	-.000001	7.675844	.084413
272	-.000001	7.527816	-.228069
273	-.000000	6.383487	-.406856
274	.000000	5.368747	-.489042
275	.000000	4.622951	-.531534
276	.000001	4.075071	-.556851
277	.000001	3.658463	-.574331
278	.000001	3.326188	-.588038
279	.000001	3.053733	-.599619
280	.000002	2.822882	-.610314
281	.000001	2.624193	-.620646
282	.000002	2.449632	-.631100

POTENTIAL FLOW - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

283	.000002	2.294156	-.642035
284	.000003	2.153396	-.653818
285	.000003	2.025249	-.666636
286	.000003	1.906000	-.680939
287	.000003	1.794098	-.697159
288	.000004	1.685699	-.716242
289	.000003	1.558170	-.741959
290	.000003	1.398406	-.777834
291	.000004	1.311361	-.813460
292	.000004	1.226962	-.846748
293	.000004	1.152023	-.880325
294	.000004	1.084832	-.915061
295	.000004	1.023733	-.951475
296	.000005	.967481	-.989961
297	.000005	.915446	-1.030834
298	.000005	.866343	-1.074403
299	.000005	.820167	-1.120975
300	.000005	.776619	-1.170835
301	.000005	.734821	-1.224270
302	.000004	.694688	-1.281546
303	.000006	.656300	-1.342915
304	.000005	.618619	-1.408614
305	.000007	.583198	-1.478826
306	.000006	.547696	-1.553741
307	.000008	.514038	-1.633336
308	.000007	.481011	-1.717610
309	.000009	.449609	-1.806285
310	.000007	.419835	-1.899017
311	.000009	.391692	-1.995098
312	.000009	.366298	-2.093429
313	.000010	.343619	-2.192683
314	.000011	.324478	-2.290968
315	.000010	.309939	-2.386034
316	.000011	.300085	-2.475141
317	.000011	.295082	-2.555150
318	.000011	.295243	-2.623023
319	.000011	.299294	-2.676044
320	.000011	.303646	-2.713423
321	.000009	.302620	-2.737794
322	.000011	.284365	-2.755516
323	.000012	.260507	-2.771598
324	.000013	.230673	-2.787831
325	.000010	.196628	-2.804601
326	.000009	.157738	-2.821452
327	.000009	.123941	-2.836065
328	.000009	.090421	-2.847232
329	.000012	.055607	-2.854787
330	.000013	.021874	-2.858830
331	.000011	-.017365	-2.859413
332	.000013	-.046093	-2.856526
333	.000013	-.080251	-2.850170
334	.000012	-.114569	-2.840273
335	.000013	-.149626	-2.826835
336	.000015	-.185232	-2.809755
337	.000012	-.222260	-2.788938
338	.000013	-.260274	-2.764197
339	.000012	-.299488	-2.735365

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

340	.000015	-.340653	-2.702206
341	.000016	-.384094	-2.664431
342	.000018	-.429672	-2.621657
343	.000016	-.478621	-2.573389
344	.000017	-.531043	-2.518981
345	.000017	-.587984	-2.457579
346	.000016	-.650603	-2.388036
347	.000017	-.720475	-2.308798
348	.000015	-.800079	-2.217710
349	.000016	-.893070	-2.111756
350	.000011	-1.005741	-1.986566
351	.000008	-1.149960	-1.835532
352	.000001	-1.351697	-1.647910
353	.000002	-1.682428	-1.403917
354	.000002	-2.549279	-1.060341

POTENTIAL FLOW - - 2-D , 23Y RELEASE D-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NUMBER 1

PT.NO.	VN	VT	SIGMA
1	-.000001	3.640523	-1.637056
2	.000001	2.461864	-2.216020
3	-.000001	2.062309	-2.644001
4	-.000000	1.846575	-2.981577
5	.000001	1.711591	-3.255777
6	.000002	1.620283	-3.480953
7	.000003	1.555826	-3.665826
8	.000003	1.509351	-3.816184
9	.000001	1.475656	-3.936107
10	.000004	1.451404	-4.028616
11	.000000	1.434414	-4.096023
12	.000002	1.423124	-4.140165
13	.000004	1.416248	-4.162549
14	.000002	1.413461	-4.164448
15	.000002	1.413513	-4.146962
16	.000003	1.416430	-4.111079
17	.000003	1.421816	-4.057683
18	.000003	1.428969	-3.987604
19	.000004	1.437773	-3.901595
20	.000002	1.448592	-3.800477
21	.000004	1.460661	-3.684939
22	.000004	1.474094	-3.555697
23	.000005	1.488809	-3.413415
24	.000004	1.505145	-3.258813
25	.000006	1.522219	-3.092560
26	.000005	1.541471	-2.915412
27	.000003	1.561740	-2.728114
28	.000003	1.586210	-2.531618
29	.000004	1.619604	-2.327888
30	.000003	1.569342	-2.132730
31	.000004	1.534851	-1.963310
32	.000003	1.506862	-1.817578
33	.000005	1.483353	-1.692590
34	.000003	1.459890	-1.584693
35	.000005	1.488889	-1.481284
36	.000002	1.512161	-1.371290
37	.000002	1.531672	-1.255089
38	.000002	1.546763	-1.134777
39	.000002	1.558537	-1.013169
40	.000002	1.566744	-.892832
41	.000002	1.573431	-.775942
42	.000002	1.578587	-.664111
43	.000001	1.583092	-.558427
44	.000001	1.588409	-.459541
45	.000001	1.593946	-.367720
46	.000001	1.601237	-.282989
47	.000001	1.610118	-.205152
48	.000001	1.620518	-.133851
49	.000000	1.633580	-.068690
50	.000000	1.648244	-.009172
51	.000000	1.666219	.045142
52	.000000	1.686087	.094771
53	.000000	1.709037	.140151
54	.000000	1.735070	.181732

POTENTIAL FLOW - - 2-D ,   23Y RELEASE 0-1-1 FLOW FIELD PLOTS

55	-.000000	1.764425	.219910
56	-.000000	1.797659	.255046
57	-.000000	1.834868	.287483
58	-.000000	1.876663	.317515
59	-.000000	1.924249	.345367
60	-.000000	1.978090	.371271
61	-.000000	2.039727	.395360
62	-.000000	2.111002	.417721
63	-.000000	2.194726	.438297
64	-.000000	2.295234	.456746
65	-.000000	2.417580	.471493
66	-.000000	2.571567	.479379
67	-.000000	2.716289	.487312
68	-.000000	2.845474	.497561
69	-.000001	2.981259	.508235
70	-.000001	3.128509	.519018
71	-.000001	3.290094	.529881
72	-.000001	3.470495	.540715
73	-.000001	3.673406	.551572
74	-.000001	3.904896	.562355
75	-.000001	4.172721	.572915
76	-.000001	4.488265	.582975
77	-.000001	4.866422	.592198
78	-.000001	5.333459	.599497
79	-.000001	5.926923	.603285
80	-.000001	6.716230	.599206
81	-.000001	7.800850	.575984
82	-.000000	9.289690	.504857
83	-.000001	11.002215	.309458
84	.000001	11.368463	-.062393
85	.000001	10.432299	-.242062
86	.000001	9.629290	-.287611
87	.000001	9.077781	-.331588
88	.000002	8.599313	-.368646
89	.000001	8.122381	-.401221
90	.000001	7.642805	-.428722
91	.000001	7.171932	-.450737
92	.000001	6.731381	-.466901
93	.000001	6.316654	-.479087
94	.000002	5.925387	-.487501
95	.000002	5.560328	-.492726
96	.000002	5.222760	-.495226
97	.000001	4.911418	-.495633
98	.000002	4.625226	-.494322
99	.000001	4.361577	-.491813
100	.000002	4.118308	-.488461
101	.000001	3.891531	-.484838
102	.000001	3.676675	-.481545
103	.000001	3.464549	-.479657
104	.000001	3.220221	-.482182
105	.000001	3.000610	-.482298
106	.000002	2.851391	-.475176
107	.000001	2.732169	-.464521
108	.000002	2.633747	-.452360
109	.000002	2.550073	-.439108
110	.000002	2.476758	-.424861
111	.000001	2.411519	-.409554

POTENTIAL FLOW -- 2-D, 23% RELEASE D=1=1 FLOW, FIELD PLOTS

112	.000002	2.352321	-.393090
113	.000002	2.297763	-.375350
114	.000002	2.247177	-.356137
115	.000002	2.199612	-.335319
116	.000002	2.154954	-.312705
117	.000002	2.112265	-.288097
118	.000001	2.071926	-.261274
119	.000001	2.033732	-.231997
120	.000001	1.997371	-.200009
121	.000001	1.962643	-.165052
122	.000001	1.930178	-.126798
123	.000001	1.899478	-.084942
124	-.000000	1.870646	-.039173
125	-.000000	1.844003	.010847
126	-.000000	1.819103	.065384
127	-.000000	1.796686	.124790
128	-.000001	1.775662	.189310
129	-.000001	1.756769	.259223
130	-.000002	1.739845	.334666
131	-.000002	1.724026	.415755
132	-.000003	1.709915	.502438
133	-.000003	1.697210	.594509
134	-.000003	1.684885	.691531
135	-.000004	1.673258	.792870
136	-.000005	1.662035	.897636
137	-.000006	1.649469	1.004602
138	-.000007	1.636974	1.112293
139	-.000008	1.623368	1.219022
140	-.000009	1.607349	1.322645
141	-.000011	1.588124	1.420640
142	-.000010	1.551011	1.508434
143	-.000011	1.542951	1.586219
144	-.000013	1.604598	1.670144
145	-.000012	1.645721	1.772668
146	-.000012	1.685583	1.894199
147	-.000015	1.728085	2.036747
148	-.000013	1.775784	2.202454
149	-.000015	1.838598	2.392502
150	-.000017	1.810603	2.592537
151	-.000021	1.793294	2.784183
152	-.000019	1.776314	2.966530
153	-.000022	1.759239	3.138730
154	-.000021	1.742074	3.300068
155	-.000024	1.723359	3.449855
156	-.000024	1.704699	3.587413
157	-.000027	1.684695	3.712059
158	-.000027	1.664511	3.823147
159	-.000026	1.643094	3.920005
160	-.000028	1.621654	4.001887
161	-.000030	1.599157	4.068068
162	-.000029	1.576830	4.117781
163	-.000030	1.553694	4.150222
164	-.000031	1.530580	4.164518
165	-.000031	1.508347	4.159706
166	-.000033	1.486728	4.134694
167	-.000030	1.467530	4.088239
168	-.000031	1.451334	4.018847

169	-.000029	1.440018	3.924712
170	-.000028	1.437114	3.803544
171	-.000027	1.445734	3.652362
172	-.000028	1.473448	3.467138
173	-.000024	1.529675	3.242139
174	-.000022	1.634366	2.968740
175	-.000018	1.825469	2.632734
176	-.000015	2.210768	2.207389
177	-.000011	3.392448	1.633349
178	.000000	.019577	-.614304
179	.000002	-.614671	-.779824
180	.000002	-.888733	-.878150
181	.000004	-1.059573	-.936740
182	.000002	-1.175740	-.969012
183	.000003	-1.256825	-.982686
184	.000003	-1.313997	-.982739
185	.000003	-1.354208	-.972579
186	.000004	-1.387558	-.954626
187	.000002	-1.402464	-.930617
188	.000003	-1.416374	-.901863
189	.000002	-1.426145	-.869314
190	.000002	-1.432981	-.833693
191	.000003	-1.437866	-.795558
192	.000002	-1.441340	-.755344
193	.000003	-1.443843	-.713400
194	.000002	-1.445859	-.670011
195	.000002	-1.447322	-.625413
196	.000002	-1.448660	-.579808
197	.000002	-1.449646	-.533374
198	.000001	-1.450810	-.486300
199	.000001	-1.451690	-.438693
200	.000001	-1.452654	-.390700
201	.000000	-1.453238	-.342444
202	.000001	-1.454009	-.294086
203	.000001	-1.454734	-.245738
204	-.000000	-1.454924	-.197569
205	.000000	-1.454400	-.149777
206	-.000000	-1.451187	-.102543
207	-.000001	-1.466838	-.059841
208	-.000001	-1.476003	-.024295
209	-.000001	-1.481412	.005096
210	-.000001	-1.482943	.029237
211	-.000001	-1.481209	.049179
212	-.000000	-1.473638	.065732
213	-.000001	-1.458929	.078945
214	-.000001	-1.452498	.090029
215	-.000000	-1.452857	.100405
216	-.000001	-1.457779	.110112
217	-.000001	-1.466145	.119111
218	-.000001	-1.476743	.127328
219	-.000000	-1.489974	.134811
220	-.000001	-1.505519	.141629
221	-.000001	-1.522349	.147758
222	-.000001	-1.541088	.153329
223	-.000001	-1.561517	.158403
224	-.000001	-1.582948	.162998
225	-.000001	-1.606120	.167273

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

226	-.000001	-1.630596	.171297
227	-.000001	-1.656085	.175069
228	-.000001	-1.682467	.178700
229	-.000001	-1.710171	.182274
230	-.000001	-1.738279	.185830
231	-.000001	-1.767027	.189366
232	-.000001	-1.796258	.193011
233	-.000001	-1.825561	.196753
234	-.000001	-1.854788	.200621
235	-.000001	-1.883354	.204680
236	-.000001	-1.911112	.208905
237	-.000001	-1.937502	.213351
238	-.000001	-1.962059	.218009
239	-.000001	-1.984186	.222893
240	-.000001	-2.003270	.228001
241	-.000001	-2.018461	.233343
242	-.000001	-2.029178	.238844
243	-.000001	-2.034373	.244575
244	-.000001	-2.033149	.250324
245	-.000001	-2.024642	.256145
246	-.000001	-2.007735	.261937
247	-.000001	-1.981827	.267485
248	-.000001	-1.946346	.272579
249	-.000001	-1.902734	.276631
250	-.000000	-1.863306	.278092
251	.000000	-1.793912	.283306
252	.000001	-1.672206	.294486
253	.000001	-1.522520	.306225
254	.000001	-1.349607	.317126
255	.000001	-1.157505	.326878
256	.000001	-.948851	.335320
257	.000000	-.724543	.342424
258	.000001	-.485289	.348150
259	.000000	-.230528	.352432
260	.000000	.039817	.355180
261	.000000	.326828	.356264
262	.000000	.630590	.355504
263	.000000	.950162	.352620
264	.000000	1.293022	.347839
265	.000000	1.661036	.339738
266	.000001	2.043314	.328465
267	.000001	2.432449	.313777
268	.000001	2.846768	.296458
269	.000001	3.330535	.273379
270	.000000	3.942800	.243357
271	.000001	4.716332	.145227
272	.000001	4.970851	-.058099
273	.000001	4.460078	-.177279
274	.000001	3.929743	-.232746
275	.000001	3.515249	-.259632
276	.000001	3.202155	-.273737
277	.000001	2.959874	-.281587
278	.000001	2.764531	-.286137
279	.000001	2.603000	-.288541
280	.000001	2.465509	-.289708
281	.000001	2.346636	-.289949
282	.000001	2.242058	-.289600

POTENTIAL FLOW - - 2-D , 23Y RELFASE 0-1-1 FLOW FIELD PLOTS

283	.000001	2.148801	-.288872
284	.000002	2.064383	-.287950
285	.000001	1.987443	-.286898
286	.000001	1.915928	-.285965
287	.000001	1.848534	-.285299
288	.000001	1.782637	-.285348
289	.000001	1.704614	-.287814
290	.000001	1.614836	-.290232
291	.000001	1.546694	-.286961
292	.000001	1.490542	-.282115
293	.000001	1.443436	-.276701
294	.000001	1.402911	-.271016
295	.000001	1.367390	-.265208
296	.000001	1.335853	-.259362
297	.000002	1.307561	-.253541
298	.000002	1.282014	-.247778
299	.000001	1.258765	-.242108
300	.000002	1.237520	-.236542
301	.000001	1.218024	-.231083
302	.000001	1.200059	-.225723
303	.000002	1.183530	-.220445
304	.000001	1.168217	-.215223
305	.000001	1.154036	-.210020
306	.000001	1.140916	-.204790
307	.000002	1.128730	-.199473
308	.000002	1.117509	-.194006
309	.000002	1.107253	-.188306
310	.000001	1.097588	-.182269
311	.000002	1.088628	-.175789
312	.000001	1.080694	-.168787
313	.000002	1.073157	-.161085
314	.000002	1.066626	-.152616
315	.000001	1.060429	-.143211
316	.000001	1.054737	-.132760
317	.000001	1.050009	-.121201
318	.000001	1.045202	-.108418
319	.000001	1.041080	-.094422
320	.000001	1.036644	-.079148
321	.000001	1.030646	-.062735
322	.000001	1.033180	-.043753
323	.000001	1.035246	-.020043
324	.000000	1.038724	.009089
325	.000001	1.043956	.044648
326	.000001	1.054307	.087699
327	.000001	1.047076	.135016
328	.000000	1.042473	.183238
329	-.000000	1.039535	.231886
330	-.000000	1.037671	.280770
331	-.000001	1.037226	.329720
332	-.000002	1.037606	.378592
333	-.000001	1.039179	.427239
334	-.000003	1.041703	.475517
335	-.000002	1.045539	.523307
336	-.000003	1.050616	.570452
337	-.000004	1.057015	.616796
338	-.000004	1.064804	.662141
339	-.000004	1.074080	.706290

ORIGINAL PAGE IS OF POOR QUALITY

POTENTIAL FLOW - - 2-D , 23% RELEASE 0-1-1 FLOW FIELD PLOTS

340	-.000004	1.085004	.749003
341	-.000006	1.097764	.789992
342	-.000006	1.112572	.828904
343	-.000005	1.129682	.865298
344	-.000007	1.149442	.898610
345	-.000007	1.172329	.928103
346	-.000008	1.198964	.952805
347	-.000007	1.230200	.971408
348	-.000008	1.267563	.982118
349	-.000008	1.313082	.982483
350	-.000006	1.370493	.969039
351	-.000004	1.446964	.936741
352	-.000001	1.558301	.877768
353	-.000001	1.748321	.778489
354	-.000001	2.263176	.610515

POTENTIAL FLOW - - 2-D , 23Y RELEASE G-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NUMBER 4

PT.NO.	VN	VT	SIGMA
1	.000001	2.263151	-.610495
2	.000001	1.748310	-.778462
3	.000001	1.558295	-.877735
4	.000001	1.446961	-.936703
5	.000001	1.370491	-.968997
6	.000001	1.313081	-.982437
7	.000002	1.267561	-.982068
8	.000001	1.230197	-.971355
9	.000001	1.198961	-.952748
10	.000001	1.172325	-.928043
11	.000001	1.149438	-.898547
12	.000002	1.129678	-.865233
13	.000002	1.112566	-.828836
14	.000002	1.097758	-.789922
15	.000002	1.084998	-.748931
16	.000002	1.074074	-.706217
17	.000002	1.064798	-.662067
18	.000001	1.057009	-.616721
19	.000002	1.050609	-.570376
20	.000002	1.045533	-.523231
21	.000002	1.041696	-.475441
22	.000001	1.039172	-.427163
23	.000002	1.037599	-.378516
24	.000002	1.037219	-.329645
25	.000001	1.037664	-.280696
26	.000001	1.039528	-.231814
27	.000002	1.042467	-.183167
28	.000001	1.047069	-.134946
29	.000001	1.054301	-.087630
30	.000001	1.043951	-.044581
31	.000001	1.038719	-.009024
32	.000001	1.035242	.020107
33	.000001	1.033175	.043816
34	.000002	1.030644	.062798
35	.000001	1.036641	.079209
36	.000002	1.041075	.094482
37	.000001	1.045197	.108476
38	.000001	1.050005	.121257
39	.000001	1.054733	.132815
40	.000001	1.060424	.143262
41	.000001	1.066620	.152666
42	.000000	1.073153	.161131
43	.000001	1.080690	.168831
44	.000000	1.088623	.175831
45	.000001	1.097584	.182308
46	.000000	1.107250	.188343
47	.0[illegible]01	1.117507	.194035
48	.0[illegible]01	1.128728	.199505
49	.000000	1.140913	.204820
50	.000001	1.154034	.210049
51	.000000	1.168216	.215250
52	.000001	1.183529	.220470
53	.000000	1.200057	.225746
54	.000000	1.218023	.231105

ORIGINAL PAGE IS OF POOR QUALITY

POTENTIAL FLOW - 2-D , 23Y RELEASE D-1-1 FLOW FIELD PLOTS

55	.000000	1.237521	.236563
56	.000001	1.258766	.242127
57	.000000	1.282015	.247796
58	.000000	1.307562	.253559
59	.000000	1.335854	.259379
60	.000000	1.367392	.265223
61	.000000	1.402914	.271030
62	.000000	1.443438	.276714
63	.000000	1.490545	.282127
64	.000000	1.546697	.286973
65	.000000	1.614840	.290242
66	.000000	1.704620	.287824
67	.000000	1.782643	.285357
68	-.000000	1.848542	.285308
69	.000000	1.915936	.285974
70	.000000	1.987452	.286906
71	-.000000	2.064393	.287958
72	-.000000	2.148813	.288880
73	-.000000	2.242070	.289608
74	-.000000	2.346650	.289956
75	-.000000	2.465524	.289715
76	.000000	2.603016	.288547
77	-.000000	2.764550	.286144
78	-.000000	2.959896	.281593
79	-.000000	3.202180	.273743
80	.000000	3.515319	.259638
81	.000000	3.929779	.232752
82	.000000	4.460124	.177283
83	.000000	4.970909	.058102
84	.000001	4.716397	-.145226
85	.000001	3.947863	-.243358
86	.000002	3.330596	-.273384
87	.000002	2.846828	-.296459
88	.000002	2.432509	-.313779
89	.000001	2.043373	-.328467
90	.000002	1.661093	-.339740
91	.000001	1.293079	-.347841
92	.000002	.950217	-.352623
93	.000002	.630645	-.355508
94	.000002	.326881	-.356267
95	.000002	.039870	-.355184
96	.000001	-.230476	-.352436
97	.000001	-.485238	-.348154
98	.000001	-.724492	-.342429
99	.000001	-.948802	-.335326
100	.000001	-1.157455	-.326883
101	.000001	-1.349559	-.317132
102	.000001	-1.522471	-.306231
103	.000001	-1.672158	-.294493
104	.000001	-1.793865	-.283314
105	.000000	-1.863262	-.278101
106	.000000	-1.902690	-.276641
107	.000001	-1.946304	-.272589
108	.000000	-1.981786	-.267496
109	.000001	-2.007694	-.261948
110	.000001	-2.024602	-.256157
111	.000001	-2.033110	-.250337

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

112	.000001	-2.034334	-.244538
113	.000001	-2.029139	-.238859
114	.000001	-2.018423	-.233358
115	.000000	-2.003232	-.228017
116	.000001	-1.984150	-.222910
117	.000000	-1.962023	-.218027
118	-.000000	-1.937467	-.213370
119	.000001	-1.911078	-.208925
120	.000000	-1.883320	-.204702
121	.000000	-1.854756	-.200644
122	.000001	-1.825578	-.196777
123	-.000000	-1.796227	-.193037
124	.000000	-1.766997	-.189393
125	.000001	-1.738249	-.185859
126	.000000	-1.710141	-.182305
127	-.000001	-1.682439	-.178733
128	-.000001	-1.656057	-.175103
129	-.000002	-1.630571	-.171334
130	-.000001	-1.606095	-.167312
131	-.000000	-1.582924	-.163039
132	.000000	-1.561493	-.158447
133	-.000001	-1.541064	-.153374
134	-.000001	-1.522327	-.147806
135	.000000	-1.505497	-.141679
136	.000001	-1.489952	-.134863
137	.000001	-1.476720	-.127382
138	.000001	-1.466121	-.119168
139	.000002	-1.457755	-.110170
140	-.000000	-1.452830	-.100465
141	-.000002	-1.452473	-.090091
142	.000000	-1.458904	-.079008
143	-.000002	-1.473612	-.065795
144	-.000002	-1.481184	-.049242
145	-.000004	-1.482920	-.029302
146	-.000001	-1.481390	-.005161
147	-.000000	-1.475982	.024228
148	-.000001	-1.466816	.059773
149	-.000003	-1.451167	.102473
150	-.000003	-1.454382	.149706
151	-.000003	-1.454907	.197497
152	-.000001	-1.454718	.245665
153	-.000001	-1.453994	.294012
154	-.000004	-1.453224	.342370
155	-.000005	-1.452641	.390624
156	-.000009	-1.451680	.438616
157	-.000006	-1.450803	.486224
158	-.000007	-1.449641	.533298
159	-.000008	-1.448659	.579732
160	-.000006	-1.447323	.625338
161	-.000007	-1.445862	.669937
162	-.000004	-1.443846	.713328
163	-.000012	-1.441345	.755271
164	-.000009	-1.437870	.795488
165	-.000011	-1.432993	.833624
166	-.000014	-1.426163	.869247
167	-.000004	-1.416393	.901801
168	-.000012	-1.402485	.930556

POTENTIAL FLOW - - 2-D , 23Y RELEASE C-1-1, FLOW-FIELD PLOTS

169	-.000007	-1.382582	.954568
170	-.000010	-1.354235	.972525
171	-.000008	-1.314027	.982688
172	-.000008	-1.256856	.982639
173	-.000005	-1.175774	.968970
174	-.000007	-1.059609	.936701
175	-.000010	-.888774	.878116
176	-.000008	-.614718	.779796
177	-.000007	.019515	.614284
178	.000002	3.392499	-1.633360
179	.000003	2.210815	-2.207405
180	.000001	1.825516	-2.632753
181	.000005	1.634411	-2.968762
182	.000005	1.529716	-3.242164
183	.000006	1.473484	-3.467165
184	.000006	1.445766	-3.652391
185	.000008	1.437143	-3.803575
186	.000011	1.440046	-3.924744
187	.000010	1.451359	-4.018882
188	.000011	1.467551	-4.088275
189	.000009	1.486747	-4.134733
190	.000009	1.508361	-4.159747
191	.000007	1.530591	-4.164560
192	.000007	1.553701	-4.150266
193	.000007	1.576833	-4.117827
194	.000010	1.599156	-4.068114
195	.000009	1.621651	-4.001934
196	.000010	1.643088	-3.920052
197	.000009	1.664503	-3.823194
198	.000011	1.684684	-3.712107
199	.000011	1.704686	-3.587461
200	.000010	1.723343	-3.449903
201	.000010	1.742057	-3.300116
202	.000009	1.759223	-3.138778
203	.000008	1.776297	-2.965578
204	.000006	1.793274	-2.784231
205	.000008	1.810580	-2.592584
206	.000006	1.838573	-2.392548
207	.000006	1.775757	-2.202499
208	.000005	1.728658	-2.036792
209	.000005	1.685555	-1.894243
210	.000006	1.645692	-1.772711
211	.000007	1.604570	-1.670186
212	.000006	1.542972	-1.586261
213	.000006	1.550984	-1.508475
214	.000005	1.588098	-1.420681
215	.000004	1.607320	-1.322686
216	.000004	1.623341	-1.219062
217	.000003	1.636947	-1.112331
218	.000004	1.649441	-1.004639
219	.000003	1.662007	-.897671
220	.000002	1.673279	-.792904
221	.000002	1.684857	-.691563
222	.000002	1.697182	-.594539
223	.000002	1.709886	-.502467
224	.000001	1.723995	-.415783
225	.000001	1.739814	-.334692

POTENTIAL FLOW - - 2-D . 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

226	.000001	1.756739	-.259248
227	.000001	1.775631	-.189333
228	.000001	1.796655	-.124812
229	.000001	1.819072	-.065405
230	.000000	1.843971	-.010867
231	.000000	1.870614	.039156
232	.000000	1.899444	.084925
233	.000000	1.930144	.126781
234	.000000	1.962609	.165036
235	.000000	1.997336	.199994
236	.000000	2.033696	.231984
237	.000000	2.071890	.261261
238	.000000	2.117228	.288085
239	.000000	2.154916	.312694
240	.000000	2.199575	.335308
241	-.000000	2.247140	.356127
242	-.000000	2.297724	.375341
243	.000000	2.352282	.393082
244	-.000000	2.411480	.409546
245	-.000000	2.476718	.424853
246	-.000000	2.550033	.439101
247	-.000000	2.633706	.452353
248	-.000001	2.732130	.464515
249	-.000001	2.851349	.475170
250	-.000000	3.000567	.482293
251	.000001	3.220178	.482177
252	.000001	3.464505	.479653
253	.000001	3.676581	.481541
254	.000001	3.891487	.484835
255	.000001	4.118265	.488458
256	.000001	4.361536	.491810
257	.000000	4.625185	.494320
258	.000001	4.911377	.495631
259	.000000	5.222719	.495225
260	.000000	5.560288	.492724
261	.000000	5.925347	.487500
262	.000000	6.316614	.479086
263	-.000000	6.731342	.466900
264	.000000	7.171894	.450736
265	.000000	7.642767	.428722
266	.000001	8.122344	.401221
267	.000000	8.599276	.368646
268	.000000	9.077747	.331589
269	.000001	9.629257	.287612
270	-.000000	10.432266	.242063
271	.000000	11.368436	.062394
272	-.000000	11.002193	-.309456
273	.000001	9.289676	-.504854
274	-.000000	7.800841	-.575981
275	-.000000	6.716224	-.599203
276	.000000	5.926919	-.603282
277	.000001	5.333456	-.599493
278	.000000	4.866421	-.592194
279	.000000	4.488265	-.582972
280	.000000	4.172722	-.572912
281	.000000	3.904896	-.562351
282	.000001	3.673408	-.551568

POTENTIAL FLOW - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

283	.000001	3.470498	-.540711
284	.000001	3.290096	-.529876
285	.000001	3.128513	-.519013
286	.000001	2.981264	-.508230
287	.000001	2.845478	-.497556
288	.000001	2.716294	-.487306
289	.000001	2.571572	-.479373
290	.000002	2.417587	-.471486
291	.000001	2.295242	-.456738
292	.000002	2.194733	-.438289
293	.000001	2.111011	-.417712
294	.000001	2.039738	-.395351
295	.000001	1.978100	-.371261
296	.000001	1.924257	-.345357
297	.000001	1.876673	-.317503
298	.000001	1.834878	-.287471
299	.000001	1.797669	-.255033
300	.000001	1.764435	-.219896
301	.000000	1.735083	-.181718
302	.000000	1.709050	-.140136
303	-.000000	1.686100	-.094754
304	-.000000	1.666232	-.045125
305	-.000001	1.648258	.009191
306	-.000001	1.633593	.068711
307	-.000001	1.620533	.133872
308	-.000002	1.610134	.205175
309	-.000002	1.601252	.283013
310	-.000003	1.593961	.367746
311	-.000003	1.588425	.459568
312	-.000003	1.583109	.558456
313	-.000005	1.578604	.664142
314	-.000005	1.573448	.775975
315	-.000005	1.566761	.892866
316	-.000006	1.558554	1.013205
317	-.000006	1.546780	1.134814
318	-.000007	1.531686	1.255127
319	-.000008	1.512175	1.371330
320	-.000009	1.488903	1.481325
321	-.000008	1.459906	1.584734
322	-.000010	1.483369	1.692632
323	-.000011	1.506877	1.817626
324	-.000011	1.534866	1.963353
325	-.000011	1.569358	2.132774
326	-.000011	1.619622	2.327932
327	-.000014	1.586226	2.531663
328	-.000015	1.561756	2.728159
329	-.000018	1.541487	2.915458
330	-.000020	1.522234	3.092606
331	-.000019	1.505159	3.258858
332	-.000022	1.488823	3.413461
333	-.000022	1.474108	3.555742
334	-.000026	1.460674	3.684983
335	-.000024	1.448602	3.800521
336	-.000025	1.437782	3.901639
337	-.000027	1.428976	3.987647
338	-.000028	1.421812	4.057726
339	-.000026	1.416435	4.111121

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

340	-.000029	1.413517	4.147002
341	-.000031	1.413462	4.164486
342	-.000033	1.416246	4.162585
343	-.000030	1.423121	4.140200
344	-.000033	1.434408	4.096055
345	-.000033	1.451394	4.028647
346	-.000031	1.475644	3.936136
347	-.000031	1.509336	3.816211
348	-.000029	1.555809	3.665851
349	-.000028	1.620263	3.480976
350	-.000019	1.711567	3.255799
351	-.000015	1.846549	2.981597
352	-.000005	2.062288	2.644019
353	-.000004	2.461849	2.216035
354	-.000003	3.640516	1.637067

ORIGINAL PAGE IS OF POOR QUALITY

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

DOUGLAS AIRCRAFT COMPANY TWO-DIMENSIONAL POTENTIAL FLOW PROGRAM

COMBINED FLOW

2-D OCSEE MOD 3A

ALPHA = .000000 ALPHA 0 = .000003 NO. OF BODIES 2

CL = .000013 CHORD = 1.000000 TOTAL ELEMENTS 354

BODY ID = 1 2-D OCSEE NO. OF ELEMENTS 177

I	X	Y	S	VT	CP	J	SIGMA	VN
1	35.624785	-3.960300	.005162	-1.005492	-.011013	1	.000129	-.000000
2	34.874355	-3.960300	.015486	-1.004987	-.009998	2	.000561	-.000000
3	34.123925	-3.960300	.025810	-1.004562	-.009145	3	.001372	-.000000
4	33.373495	-3.960300	.036134	-1.004159	-.008335	4	.002556	-.000000
5	32.623065	-3.960300	.046458	-1.003779	-.007572	5	.004107	-.000000
6	31.872635	-3.960300	.056782	-1.003418	-.006848	6	.006018	-.000000
7	31.122205	-3.960300	.067106	-1.003076	-.006161	7	.008282	-.000000
8	30.371775	-3.960300	.077429	-1.002752	-.005512	8	.010891	-.000000
9	29.621345	-3.960300	.087753	-1.002447	-.004901	9	.013840	-.000000
10	28.870915	-3.960300	.098077	-1.002162	-.004329	10	.017120	-.000000
11	28.120490	-3.960300	.108401	-1.001896	-.003796	11	.020725	-.000000
12	27.370065	-3.960300	.118725	-1.001651	-.003304	12	.024647	-.000000
13	26.619635	-3.960300	.129049	-1.001418	-.002838	13	.028879	-.000000
14	25.869205	-3.960300	.139373	-1.001223	-.002447	14	.033415	-.000000
15	25.118775	-3.960300	.149697	-1.001033	-.002067	15	.038248	-.000000
16	24.368345	-3.960300	.160021	-1.000874	-.001749	16	.043370	-.000000
17	23.617915	-3.960300	.170345	-1.000750	-.001501	17	.048775	-.000000
18	22.867485	-3.960300	.180669	-1.000643	-.001286	18	.054457	-.000000
19	22.117055	-3.960300	.190993	-1.000551	-.001103	19	.060408	-.000000
20	21.366625	-3.960300	.201316	-1.000510	-.001020	20	.066622	-.000000
21	20.616195	-3.960300	.211640	-1.000487	-.000974	21	.073095	-.000000
22	19.865765	-3.960300	.221964	-1.000485	-.000971	22	.079819	-.000000
23	19.115335	-3.960300	.232288	-1.000526	-.001053	23	.086789	-.000000
24	18.364905	-3.960300	.242612	-1.000601	-.001202	24	.094002	-.000000
25	17.614475	-3.960300	.252936	-1.000715	-.001430	25	.101450	-.000000
26	16.864045	-3.960300	.263260	-1.000853	-.001706	26	.109131	-.000000
27	16.113615	-3.960300	.273584	-1.000976	-.001952	27	.117042	-.000000
28	15.363190	-3.960300	.283908	-1.001121	-.002242	28	.125177	-.000001
29	14.614730	-3.960300	.294205	-1.000939	-.001880	29	.133513	-.000001
30	13.930440	-3.960300	.303619	-1.004105	-.008226	30	.141479	-.000001
31	13.360200	-3.960300	.311464	-1.006420	-.012882	31	.148445	-.000000
32	12.885000	-3.960300	.318001	-1.008345	-.016759	32	.154534	-.000001
33	12.489000	-3.960300	.323449	-1.010096	-.020294	33	.159851	-.000001
34	12.159000	-3.960300	.327989	-1.012092	-.024329	34	.164387	-.000001
35	11.858355	-3.960300	.332125	-1.012530	-.025218	35	.168345	-.000001
36	11.557065	-3.960300	.336270	-1.014087	-.028372	36	.171697	-.000001
37	11.255775	-3.960300	.340415	-1.016191	-.032645	37	.174028	-.000001
38	10.954485	-3.960300	.344560	-1.018429	-.037198	38	.175149	-.000001
39	10.653195	-3.960300	.348705	-1.020684	-.041797	39	.175040	-.000001
40	10.351905	-3.960300	.352850	-1.022793	-.046105	40	.173778	-.000001
41	10.050615	-3.960300	.356995	-1.024742	-.050097	41	.171988	-.000001

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

DOUGLAS AIRCRAFT COMPANY TWO-DIMENSIONAL POTENTIAL FLOW PROGRAM

COMBINED FLOW 2-D OCSEE MOD 3A

ALPHA = .000000 ALPHA 0 = .000003 NO. OF BODIES 2

CL = .000013 CHORD = 1.000000 TOTAL ELEMENTS 354

BODY ID = 1 2-D OCSEE NO. OF ELEMENTS 177

I	X	Y	S	VT	CP	J	SIGMA	VN
42	9.749325	-3.961300	.361140	-1.026525	-.053753	42	.168318	-.000001
43	9.448035	-3.960300	.365285	-1.028107	-.057005	43	.164420	-.000001
44	9.146745	-3.960300	.369430	-1.029593	-.060062	44	.159933	-.000001
45	8.845455	-3.960300	.373575	-1.030913	-.062783	45	.154988	-.000001
46	8.544165	-3.960300	.377719	-1.032176	-.065388	46	.149699	-.000001
47	8.242875	-3.960300	.381864	-1.033416	-.067948	47	.144160	-.000000
48	7.941585	-3.960300	.386009	-1.034614	-.070426	48	.138447	-.000000
49	7.640295	-3.960300	.390154	-1.035846	-.072976	49	.132624	-.000001
50	7.339005	-3.960300	.394299	-1.037090	-.075555	50	.126735	-.000001
51	7.037715	-3.960300	.398444	-1.038473	-.078426	51	.120822	-.000001
52	6.736425	-3.960300	.402589	-1.039900	-.081393	52	.114909	-.000000
53	6.435130	-3.961300	.406734	-1.041505	-.084732	53	.109018	-.000000
54	6.133835	-3.960300	.410879	-1.043259	-.088389	54	.103160	-.000000
55	5.832545	-3.960300	.415024	-1.045231	-.092508	55	.097345	-.000000
56	5.531255	-3.960300	.419169	-1.047476	-.097206	56	.091577	-.000000
57	5.229965	-3.960300	.423314	-1.050035	-.102573	57	.085858	-.000000
58	4.928675	-3.960300	.427459	-1.052997	-.108803	58	.080184	-.000000
59	4.627385	-3.961300	.431604	-1.056504	-.116201	59	.074548	-.000000
60	4.326095	-3.960300	.435749	-1.060693	-.125070	60	.068938	-.000000
61	4.024805	-3.960300	.439894	-1.065827	-.135987	61	.063337	-.000000
62	3.723515	-3.960300	.444039	-1.072290	-.149807	62	.057715	-.000000
63	3.422225	-3.960300	.448184	-1.080780	-.168086	63	.052027	-.000000
64	3.120935	-3.960300	.452329	-1.092799	-.194209	64	.046194	-.000000
65	2.819645	-3.960300	.456474	-1.113762	-.240466	65	.040032	-.000000
66	2.553930	-3.958435	.460129	-1.131816	-.281068	66	.037357	-.000000
67	2.329585	-3.952315	.463217	-1.142369	-.305007	67	.037032	-.000000
68	2.116580	-3.942055	.466151	-1.147232	-.316142	68	.036335	-.000000
69	1.914415	-3.928610	.468939	-1.150178	-.322968	69	.035515	-.000000
70	1.722585	-3.912475	.471587	-1.152008	-.327123	70	.034705	-.000000
71	1.540605	-3.893965	.474104	-1.153157	-.329772	71	.033919	-.000000
72	1.368035	-3.873275	.476495	-1.153727	-.331086	72	.033264	-.000000
73	1.204460	-3.850500	.478767	-1.153733	-.331101	73	.032753	-.000000
74	1.049495	-3.825670	.480926	-1.153168	-.329796	74	.032438	-.000000
75	.902785	-3.798730	.482978	-1.151954	-.326997	75	.032381	-.000000
76	.764030	-3.769520	.484929	-1.149691	-.321790	76	.032702	-.000000
77	.632990	-3.737770	.486785	-1.146037	-.313400	77	.033456	-.000000
78	.509500	-3.703225	.488550	-1.139959	-.299505	78	.034931	-.000000
79	.393535	-3.664545	.490231	-1.129683	-.276184	79	.037397	-.000000
80	.285300	-3.621075	.491837	-1.110828	-.233939	80	.041620	-.000000
81	.187060	-3.571770	.493354	-1.073351	-.152082	81	.048919	-.000000
82	.102450	-3.512605	.494776	-.984433	.030893	82	.062472	-.000000

POTENTIAL FLOW - - 2-C , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

DOUGLAS AIRCRAFT COMPANY TWO-DIMENSIONAL POTENTIAL FLOW PROGRAM

COMBINED FLOW 2-D QCSEE MOD 3A

ALPHA = .000000 ALPHA 0 = .000003 NO. OF BODIES 2

CL = .000013 CHORD = 1.000000 TOTAL ELEMENTS 354

BODY ID = 1 2-D QCSEE NO. OF ELEMENTS 177

I	X	Y	S	VT	CP	J	SIGMA	VN
83	.040120	-3.445465	.496049	-.780867	.390247	83	.084544	-.000000
84	.006150	-3.368185	.497223	-.356058	.873223	84	.112818	-.000000
85	.003235	-3.284830	.498382	.038503	.998517	85	.120381	-.000000
86	.015440	-3.205100	.499495	.313570	.901674	86	.120313	-.000000
87	.037460	-3.131925	.500549	.541899	.706346	87	.115432	.000000
88	.066500	-3.066095	.501540	.722704	.477699	88	.108984	.000000
89	.103035	-3.003170	.502542	.872726	.238349	89	.102179	-.000000
90	.148890	-2.939580	.503622	1.006059	-.012155	90	.094373	-.000000
91	.204435	-2.875930	.504786	1.121542	-.257856	91	.086064	-.000000
92	.268730	-2.813785	.506017	1.219468	-.487101	92	.077537	.000000
93	.342130	-2.753290	.507326	1.300811	-.692110	93	.069202	-.000000
94	.426300	-2.69 0	.508747	1.370833	-.879184	94	.060806	.000000
95	.521655	-2.63 5	.510286	1.430601	-1.046620	95	.052424	.000000
96	.628645	-2.57 0	.511951	1.481492	-1.194820	96	.044090	.000000
97	.747785	-2.52 .0	.513752	1.524678	-1.324643	97	.035724	-.000000
98	.879640	-2.47 0	.515698	1.560932	-1.436510	98	.027303	-.000000
99	1.024845	-2.426275	.517800	1.590815	-1.530693	99	.018709	-.000000
100	1.184105	-2.383515	.520069	1.614405	-1.606302	100	.009863	-.000000
101	1.358170	-2.346780	.522519	1.631208	-1.660838	101	.000570	-.000000
102	1.547845	-2.315770	.525162	1.639730	-1.688715	102	-.009337	-.000000
103	1.753965	-2.293475	.528016	1.636660	-1.678656	103	-.020167	-.000000
104	1.978620	-2.281295	.531112	1.610347	-1.593219	104	-.032523	.000000
105	2.218845	-2.278915	.534417	1.569326	-1.462785	105	-.041184	.000000
106	2.465525	-2.282540	.537812	1.537634	-1.364320	106	-.045421	.000000
107	2.714170	-2.289700	.541234	1.516035	-1.298361	107	-.049902	.000000
108	2.964740	-2.300290	.544684	1.497422	-1.242272	108	-.054639	.000000
109	3.217190	-2.314185	.548162	1.479646	-1.189351	109	-.059549	.000000
110	3.471470	-2.331250	.551669	1.461712	-1.136601	110	-.064626	.000000
111	3.727515	-2.351340	.555202	1.443224	-1.082895	111	-.069800	.000000
112	3.985255	-2.374295	.558762	1.423982	-1.027723	112	-.075066	.000000
113	4.244620	-2.399955	.562347	1.403894	-.970917	113	-.080392	.000000
114	4.505520	-2.428130	.565958	1.383125	-.913035	114	-.085731	.000000
115	4.767860	-2.458630	.569591	1.361679	-.854168	115	-.091107	.000000
116	5.031540	-2.491260	.573246	1.339672	-.794721	116	-.096484	.000000
117	5.296455	-2.525600	.576922	1.317325	-.735344	117	-.101855	.000000
118	5.562495	-2.562025	.580615	1.294769	-.676403	118	-.107217	.000000
119	5.829535	-2.599705	.584326	1.272074	-.618173	119	-.112574	.000000
120	6.097450	-2.638595	.588050	1.249512	-.561280	120	-.117903	.000000
121	6.366105	-2.678450	.591786	1.227088	-.505745	121	-.123229	.000000
122	6.635370	-2.719015	.595533	1.205032	-.452163	122	-.128512	.000000
123	6.905100	-2.760220	.599286	1.183445	-.400541	123	-.133764	.000000

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

DOUGLAS AIRCRAFT COMPANY TWO-DIMENSIONAL POTENTIAL FLOW PROGRAM

COMBINED FLOW 2-D OCSEE MOD 3A

ALPHA = .000000 ALPHA 0 = .000003 NO. OF BODIES 2

CL = .000013 CHORD = 1.000000 TOTAL ELEMENTS 354

BODY ID = 1 2-D OCSEE NO. OF ELEMENTS 177

I	X	Y	S	VT	CP	J	SIGMA	VN
124	7.175155	-2.801210	.603044	1.162380	-.351127	124	-.138977	.000000
125	7.445225	-2.842290	.606802	1.142037	-.304249	125	-.144116	.000000
126	7.714990	-2.882970	.610556	1.122405	-.259792	126	-.149175	.000000
127	7.984300	-2.922985	.614301	1.103691	-.218135	127	-.154100	.000000
128	8.253015	-2.962075	.618037	1.085840	-.179049	128	-.158883	.000000
129	8.521000	-2.999985	.621760	1.069068	-.142907	129	-.163446	.000000
130	8.788115	-3.036465	.625469	1.053320	-.109483	130	-.167759	.000000
131	9.054235	-3.071785	.629162	1.038711	-.078920	131	-.171751	.000000
132	9.319235	-3.104210	.632835	1.025272	-.051182	132	-.175345	.000000
133	9.583005	-3.135015	.636489	1.013121	-.026414	133	-.178450	.000000
134	9.845435	-3.163490	.640120	1.002309	-.004623	134	-.180983	.000000
135	10.106415	-3.189440	.643729	.992864	.014222	135	-.182851	.000000
136	10.365855	-3.212680	.647312	.984880	.030012	136	-.183955	.000000
137	10.623675	-3.233025	.650870	.978586	.042370	137	-.184186	.000000
138	10.879790	-3.250315	.654402	.973881	.051555	138	-.183497	.000000
139	11.134125	-3.264405	.657906	.971099	.056966	139	-.181798	.000001
140	11.386620	-3.275145	.661383	.970619	.057898	140	-.179033	.000000
141	11.637225	-3.282405	.664832	.973274	.052738	141	-.175148	.000001
142	11.885525	-3.286075	.668248	.982272	.035143	142	-.169941	.000000
143	12.133355	-3.287000	.671658	.991437	.017052	143	-.164883	.000001
144	12.406935	-3.287000	.675422	.997765	.004466	144	-.160727	.000000
145	12.735235	-3.287000	.679938	1.003136	-.006282	145	-.156278	.000000
146	13.129195	-3.287000	.685358	1.007577	-.015212	146	-.151213	.000000
147	13.601940	-3.287000	.691862	1.011376	-.022881	147	-.145367	.000000
148	14.169240	-3.287000	.699666	1.014768	-.029754	148	-.138623	.000000
149	14.850000	-3.287000	.709032	1.018318	-.036972	149	-.130888	.000000
150	15.592370	-3.287000	.719245	1.017893	-.036106	150	-.122691	.000000
151	16.334465	-3.287000	.729454	1.017647	-.035605	151	-.114714	.000000
152	17.076560	-3.287000	.739663	1.017358	-.035017	152	-.106958	.000000
153	17.818655	-3.287000	.749873	1.017046	-.034382	153	-.099425	.000000
154	18.560750	-3.287000	.760082	1.016683	-.033645	154	-.092120	.000000
155	19.302850	-3.287000	.770291	1.016319	-.032904	155	-.085048	.000000
156	20.044945	-3.287000	.780500	1.015937	-.032127	156	-.078213	.000000
157	20.787040	-3.287000	.790710	1.015548	-.031338	157	-.071619	.000000
158	21.529135	-3.287000	.800919	1.015152	-.030533	158	-.065275	.000000
159	22.271230	-3.287000	.811128	1.014738	-.029694	159	-.059183	.000000
160	23.013325	-3.287000	.821337	1.014317	-.028830	160	-.053349	.000000
161	23.755420	-3.287000	.831547	1.013879	-.027950	161	-.047781	.000000
162	24.497515	-3.287000	.841756	1.013427	-.027033	162	-.042484	-.000000
163	25.239610	-3.287000	.851965	1.012977	-.026122	163	-.037465	.000000
164	25.981705	-3.287000	.862174	1.012525	-.025208	164	-.032730	.000000

POTENTIAL FLOW - - 2-D , 23V RELEASE 0-1-1 FLOW FIELD PLOTS.

DOUGLAS AIRCRAFT COMPANY TWO-DIMENSIONAL POTENTIAL FLOW PROGRAM

COMBINED FLOW 2-D, OCSEE MOD.3A

ALPHA = .000000 ALPHA 0 = .000003 NO. OF BODIES 2

CL = .000013 CHORD = 1.000000 TOTAL ELEMENTS 354

BODY ID = 1 2-D, OCSEE NO. OF ELEMENTS 177

I	X	Y	S	VT	CP	J	SIGMA	VN
165	26.723860	-3.287000	.872384	1.012047	-.024240	165	-.028287	.000000
166	27.465900	-3.287000	.882593	1.011576	-.023285	166	-.024141	.000000
167	28.207995	-3.287000	.892802	1.011079	-.022280	167	-.020300	-.000000
168	28.950090	-3.287000	.903012	1.010579	-.021271	168	-.016769	-.000000
169	29.692185	-3.287000	.913221	1.010075	-.020252	169	-.013557	.000000
170	30.434280	-3.287000	.923430	1.009550	-.019191	170	-.010670	.000000
171	31.176375	-3.287000	.933639	1.009024	-.018129	171	-.008115	-.000000
172	31.918470	-3.287000	.943849	1.008478	-.017027	172	-.005699	.000000
173	32.660565	-3.287000	.954058	1.007929	-.015920	173	-.004028	-.000000
174	33.402660	-3.287000	.964267	1.007359	-.014773	174	-.002510	-.000000
175	34.144755	-3.287000	.974476	1.006782	-.013610	175	-.001352	.000000
176	34.886850	-3.287000	.984686	1.006177	-.012393	176	-.000558	.000000
177	35.628950	-3.287000	.994895	1.005492	-.011013	177	-.000135	.000000

INTEGRATED VALUES

CY = 6.33279 CX = -.00672

CL = 6.33279 CD = -.00672 CM = -28.72288

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

DOUGLAS AIRCRAFT COMPANY TWO-DIMENSIONAL POTENTIAL FLOW PROGRAM

COMBINED FLOW 2-D QCSEE MOD 3A

ALPHA = .000000 ALPHA 0 = .000003 NO. OF BODIES 2

CL = .000013 CHORD = 1.000000 TOTAL ELEMENTS 354

BODY ID = 2 2-D QCSEE NO. OF ELEMENTS 177

I	X	Y	S	VT	CP	J	SIGMA	VN
1	35.676950	3.287000	.005105	-1.005492	-.011013	178	-.000135	.000000
2	34.886850	3.287000	.015314	-1.006177	-.012393	179	-.000558	.000000
3	34.144755	3.287000	.025523	-1.006782	-.013611	180	-.001352	.000000
4	33.402660	3.287000	.035733	-1.007359	-.014773	181	-.002510	.000000
5	32.660565	3.287000	.045942	-1.007929	-.015920	182	-.[illegible]4028	.000000
6	31.918470	3.287000	.056151	-1.008478	-.017027	183	-. [illegible]5899	.000000
7	31.176375	3.287000	.066360	-1.009024	-.018129	184	-. [illegible]8115	.000000
8	30.434280	3.287000	.076570	-1.009550	-.019190	185	-.[illegible]0670	.000000
9	29.692185	3.287000	.086779	-1.010075	-.020252	186	-.013557	.000000
10	28.950090	3.287000	.096988	-1.010579	-.021271	187	-.016769	.000000
11	28.207995	3.287000	.107197	-1.011078	-.022280	188	-.020299	.000000
12	27.465900	3.287000	.117407	-1.011575	-.023285	189	-.024141	.000000
13	26.723800	3.287000	.127616	-1.012047	-.024240	190	-.028287	.000000
14	25.981705	3.287000	.137825	-1.012525	-.025208	191	-.032730	.000000
15	25.239610	3.287000	.148034	-1.012977	-.026122	192	-.037465	.000000
16	24.497515	3.287000	.158244	-1.013426	-.027033	193	-.042484	.000000
17	23.755420	3.287000	.168453	-1.013879	-.027950	194	-.047781	.000000
18	23.013325	3.287000	.178662	-1.014312	-.028829	195	-.053349	.000000
19	22.271230	3.287000	.188872	-1.014738	-.029694	196	-.059183	.000000
20	21.529135	3.287000	.199081	-1.015152	-.030533	197	-.065275	.000000
21	20.787040	3.287000	.209290	-1.015548	-.031338	198	-.071619	.000000
22	20.044945	3.287000	.219499	-1.015937	-.032127	199	-.078212	.000000
23	19.302850	3.287000	.229709	-1.016319	-.032904	200	-.085047	.000000
24	18.560750	3.287000	.239918	-1.016683	-.033645	201	-.092120	.000000
25	17.818655	3.287000	.250127	-1.017046	-.034382	202	-.099424	.000000
26	17.076560	3.287000	.260336	-1.017358	-.035017	203	-.106957	.000000
27	16.334465	3.287000	.270546	-1.017647	-.035605	204	-.114713	-.000000
28	15.592370	3.287000	.280755	-1.017893	-.036106	205	-.122690	.000000
29	14.850000	3.287000	.290968	-1.018318	-.036972	206	-.130888	.000000
30	14.169240	3.287000	.300333	-1.014768	-.029754	207	-.138623	.000000
31	13.601940	3.287000	.308138	-1.011376	-.022881	208	-.145367	.000000
32	13.129195	3.287000	.314642	-1.007577	-.015211	209	-.151212	.000000
33	12.735235	3.287000	.320062	-1.003136	-.006281	210	-.156278	.000000
34	12.406935	3.287000	.324578	-.997765	.004466	211	-.160726	.000000
35	12.133355	3.287000	.328342	-.991437	.017052	212	-.164882	.000000
36	11.885525	3.286575	.331751	-.982272	.035143	213	-.169940	.000000
37	11.637225	3.282405	.335168	-.973274	.052738	214	-.175148	-.000000
38	11.386620	3.275145	.338617	-.970619	.057898	215	-.179032	-.000000
39	11.134125	3.264405	.342094	-.971100	.056966	216	-.181797	.000000
40	10.879790	3.250315	.345598	-.973882	.051554	217	-.183496	-.000000
41	10.623675	3.233025	.349130	-.978586	.042369	218	-.184186	.000000

POTENTIAL FLOW - - 2-D . 23Y RELEASE 0-1-1 FLOW.FIELD PLOTS

DOUGLAS AIRCRAFT COMPANY TWO-DIMENSIONAL POTENTIAL FLOW PROGRAM.

COMBINED FLOW. 2-D OCSEE MOD 3A

ALPHA = .000000 ALPHA+O = .000003 NO. OF BODIES 2

CL = .000013 CHORD = 1.000000 TOTAL ELEMENTS 354

BODY ID = 2 2-D OCSEF NO. OF ELEMENTS 177

I	X	Y	S	VT	CP	J	SIGMA	VN
42	10.365855	3.212680	.352688	-.984889	.030011	219	-.183955	-.000000
43	10.106415	3.189440	.356271	-.992864	.014221	220	-.182851	-.000000
44	9.845435	3.163490	.359879	-1.002309	-.004623	221	-.180983	-.000000
45	9.583005	3.135015	.363511	-1.013121	-.026414	222	-.178449	-.000000
46	9.319235	3.104210	.367164	-1.025272	-.051182	223	-.175345	.000000
47	9.054235	3.071285	.370838	-1.038711	-.078920	224	-.171751	.000000
48	8.788115	3.036465	.374530	-1.053320	-.109484	225	-.167759	.000000
49	8.521030	2.999985	.378239	-1.069068	-.142907	226	-.163446	.000000
50	8.253015	2.962075	.381963	-1.085840	-.179049	227	-.158883	.000000
51	7.984300	2.922985	.385699	-1.103692	-.218135	228	-.154099	.000000
52	7.714990	2.882970	.389444	-1.122405	-.259793	229	-.149175	.000000
53	7.445225	2.842290	.393197	-1.142037	-.304249	230	-.144116	.000000
54	7.175155	2.801210	.396956	-1.162380	-.351128	231	-.138977	.000000
55	6.905100	2.760020	.400714	-1.183445	-.400541	232	-.133763	.000000
56	6.635370	2.719015	.404467	-1.205032	-.452103	233	-.128512	.000000
57	6.366105	2.678450	.408213	-1.227088	-.505745	234	-.123229	.000000
58	[illegible]97450	2.[illegible]38595	.411950	-1.249512	-.561280	235	-.117903	.000000
59	[illegible]29535	2[illegible]99705	.415674	-1.272074	-.618173	236	-.112574	.000000
60	[illegible]62495	2[illegible]62025	.419384	-1.294760	-.676403	237	-.107217	.000000
61	[illegible]96455	2.[illegible]25800	.423078	-1.317325	-.735344	238	-.101855	.000000
62	5.031540	2.491260	.426754	-1.339672	-.794721	239	-.096484	.000000
63	4.767860	2.458630	.430409	-1.361679	-.854169	240	-.091107	.000000
64	4[illegible]20	2.428130	.434042	-1.383125	-.913035	241	-.085731	.000000
65	4.[illegible]20	2.399955	.437652	-1.403894	-.970917	242	-.080392	.000000
66	3[illegible]55	2.374[illegible]5	.441238	-1.423982	-1.027724	243	-.075066	.000000
67	3.[illegible]15	2.351[illegible]0	.444798	-1.443224	-1.082895	244	-.069800	.000000
68	3.471470	2.331[illegible]0	.448331	-1.461712	-1.136601	245	-.064625	.000000
69	3.217190	2.314[illegible]5	.451838	-1.479646	-1.189351	246	-.059549	.000000
70	2.964740	2.300[illegible]0	.455316	-1.497422	-1.242272	247	-.054639	.000000
71	2.714170	2.289[illegible]0	.458766	-1.516035	-1.298361	248	-.049902	.000000
72	2.465525	2.282540	.462188	-1.537634	-1.364320	249	-.045421	.000000
73	2.218845	2.278915	.465583	-1.569326	-1.462785	250	-.041183	.000000
74	1.978620	2.281295	.468888	-1.610347	-1.593219	251	-.032522	.000000
75	1.753965	2.293475	.471984	-1.636660	-1.678656	252	-.020166	.000000
76	1.547845	2.315770	.474838	-1.639730	-1.688715	253	-.009337	.000000
77	1.358170	2.346280	.477481	-1.631208	-1.660838	254	.000570	.000000
78	1.184105	2.383515	.479931	-1.614404	-1.606302	255	.009868	.000000
79	1.024845	2.426275	.482200	-1.590815	-1.530692	256	.018710	.000000
80	.879640	2.473580	.484302	-1.560937	-1.436509	257	.027303	.000000
81	.747785	2.524620	.486248	-1.524678	-1.324642	258	.035724	.000000
82	.628645	2.578700	.488049	-1.481492	-1.194818	259	.044091	-.000000

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

DOUGLAS AIRCRAFT COMPANY TWO-DIMENSIONAL POTENTIAL FLOW PROGRAM

COMBINED FLOW 2-D OCSEE MOD 3A

ALPHA = .[illegible]0000 ALPHA 0 = .000003 NO. OF BODIES 2

CL = .000013 CHORD = 1.000000 TOTAL ELEMENTS 354

BODY ID = 2 2-D OCSEE NO. OF ELEMENTS 177

I	X	Y	S	VT	CP	J	SIGMA	VN
83	.571655	2.635205	.489714	-1.430601	-1.046618	260	.052424	-.000000
84	.426300	2.693580	.491253	-1.370832	-.879182	261	.060806	-.000000
85	.342130	2.753290	.492674	-1.300810	-.692108	262	.069202	-.000006
86	.268730	2.813785	.493983	-1.219467	-.487099	263	.077537	-.000000
87	.204435	2.875930	.495214	-1.121541	-.257854	264	.086064	-.000000
88	.148890	2.939580	.496378	-1.006058	-.012153	265	.094373	-.000000
89	.103035	3.003170	.497458	-.872725	.238351	266	.102179	-.000001
90	.066500	3.066095	.498460	-.722703	.477701	267	.108984	-.000001
91	.037460	3.131925	.499451	-.541897	.706347	268	.115432	-.000001
92	.015440	3.205100	.500505	-.313568	.901675	269	.120313	-.000001
93	.003235	3.284830	.501618	-.038502	.998518	270	.120381	-.000001
94	.008150	3.368185	.502777	.356059	.873222	271	.112818	-.000001
95	.046120	3.445465	.503951	.780869	.390244	272	.084544	-.000000
96	.102450	3.512605	.505224	.984434	.030889	273	.062472	-.000001
97	.187060	3.571270	.506646	1.073353	-.152086	274	.048919	-.000000
98	.285300	3.621075	.508163	1.110830	-.233942	275	.041620	-.000000
99	.393535	3.664045	.509769	1.129684	-.276187	276	.037396	-.000006
100	.509500	3.703025	.511450	1.139960	-.299508	277	.034931	-.000000
101	.632990	3.737770	.513215	1.146038	-.313402	278	.033456	-.000000
102	.764030	3.769520	.515071	1.149692	-.321793	279	.032701	-.000000
103	.902785	3.798730	.517022	1.151955	-.327000	280	.032381	-.000000
104	1.049495	3.825670	.519074	1.153169	-.329798	281	.032438	-.000000
105	1.204460	3.850500	.521233	1.153734	-.331102	282	.032753	-.000006
106	1.368035	3.873275	.523505	1.153728	-.331088	283	.033264	-.000000
107	1.540605	3.893965	.525896	1.153158	-.329774	284	.033919	-.000000
108	1.722585	3.912475	.528413	1.152009	-.327124	285	.034709	-.000000
109	1.914415	3.928610	.531061	1.150178	-.322910	286	.035515	-.000000
110	2.116580	3.942055	.533849	1.147233	-.316144	287	.036335	-.000000
111	2.329585	3.952315	.536783	1.142370	-.305008	288	.037032	-.000000
112	2.553930	3.958435	.539871	1.131817	-.281069	289	.037356	-.000000
113	2.819645	3.960300	.543526	1.113763	-.240468	290	.040032	-.000000
114	3.120935	3.960300	.547671	1.092799	-.194210	291	.046193	-.000000
115	3.422225	3.960300	.551816	1.080781	-.168088	292	.052627	-.000000
116	3.723515	3.960300	.555961	1.072291	-.149808	293	.057715	-.000000
117	4.024805	3.960300	.560106	1.065827	-.135988	294	.063337	-.000000
118	4.326095	3.960300	.564251	1.060694	-.125071	295	.068937	-.000000
119	4.627385	3.960300	.568396	1.056505	-.116202	296	.074548	-.000000
120	4.928675	3.960300	.572541	1.052997	-.108804	297	.080184	-.000001
121	5.229965	3.960300	.576686	1.050035	-.102574	298	.085858	-.000001
122	5.531255	3.960300	.580831	1.047476	-.097207	299	.091577	-.000001
123	5.832545	3.960300	.584976	1.045231	-.092509	300	.097344	-.000001

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

DOUGLAS AIRCRAFT COMPANY TWO-DIMENSIONAL POTENTIAL FLOW PROGRAM

COMBINED FLOW 2-D OCSEE MOD 3A

ALPHA = .000000 ALPHA 0 = .000003 NO. OF BODIES 2

CL = .000013 CHORD = 1.000000 TOTAL ELEMENTS 354

BODY ID = 2 2-D OCSEE NO. OF ELEMENTS 177

I	X	Y	S	VT	CP	J	SIGMA	VN
124	6.133835	3.960300	.589121	1.043259	-.088390	301	.103159	-.000001
125	6.435130	3.960300	.593266	1.041505	-.084733	302	.109017	-.000001
126	6.736425	3.960300	.597411	1.039901	-.081393	303	.114909	-.000001
127	7.037715	3.960300	.601556	1.038473	-.078427	304	.120822	-.000001
128	7.339005	3.960300	.605701	1.037090	-.075556	305	.126735	-.000001
129	7.640295	3.960300	.609846	1.035846	-.072977	306	.132624	-.000001
130	7.941585	3.960300	.613991	1.034614	-.070426	307	.138447	-.000001
131	8.242875	3.960300	.618136	1.033416	-.067949	308	.144160	-.000001
132	8.544165	3.960300	.622280	1.032176	-.065388	309	.149699	-.000001
133	8.845455	3.960300	.626425	1.030914	-.062783	310	.154988	-.000001
134	9.146745	3.960300	.630570	1.029593	-.060062	311	.159933	-.000001
135	9.448035	3.960300	.634715	1.028108	-.057005	312	.164420	-.000001
136	9.749325	3.960300	.638860	1.026525	-.053753	313	.168318	-.000001
137	10.050615	3.960300	.643005	1.024742	-.050097	314	.171488	-.000001
138	10.351905	3.960300	.647150	1.022793	-.046106	315	.173777	-.000001
139	10.653195	3.960300	.651295	1.020685	-.041797	316	.175040	-.000001
140	10.954485	3.960300	.655440	1.018430	-.037199	317	.175148	-.000001
141	11.255775	3.960300	.659585	1.016191	-.032645	318	.174028	-.000001
142	11.557065	3.960300	.663730	1.014087	-.028373	319	.171697	-.000001
143	11.858355	3.960300	.667875	1.012531	-.025218	320	.168344	-.000001
144	12.159000	3.960300	.672011	1.012092	-.024329	321	.164387	-.000001
145	12.489000	3.960300	.676551	1.010096	-.020294	322	.159850	-.000001
146	12.895000	3.960300	.681999	1.008345	-.016759	323	.154533	-.000001
147	13.360200	3.960300	.688536	1.006420	-.012882	324	.148445	-.000001
148	13.930440	3.960300	.696381	1.004105	-.008226	325	.141479	-.000001
149	14.614730	3.960300	.705795	1.000939	-.001880	326	.133512	-.000001
150	15.363190	3.960300	.716097	1.001121	-.002243	327	.125177	-.000001
151	16.113615	3.960300	.726416	1.000976	-.001952	328	.117042	-.000001
152	16.864045	3.960300	.736740	1.000853	-.001706	329	.109131	-.000001
153	17.614475	3.960300	.747064	1.000715	-.001430	330	.101449	-.000001
154	18.364905	3.960300	.757388	1.000601	-.001202	331	.094001	-.000001
155	19.115335	3.960300	.767712	1.000526	-.001053	332	.086789	-.000001
156	19.865765	3.960300	.778036	1.000485	-.000971	333	.079818	-.000001
157	20.616195	3.960300	.788359	1.000487	-.000974	334	.073094	-.000001
158	21.366625	3.960300	.798683	1.000510	-.001020	335	.066622	-.000001
159	22.117055	3.960300	.809007	1.000551	-.001103	336	.060407	-.000001
160	22.867485	3.960300	.819331	1.000642	-.001285	337	.054456	-.000000
161	23.617915	3.960300	.829655	1.000750	-.001501	338	.048775	-.000000
162	24.368345	3.960300	.839979	1.000874	-.001748	339	.043370	-.000000
163	25.118775	3.960300	.850303	1.001033	-.002066	340	.038248	-.000000
164	25.869205	3.960300	.860627	1.001223	-.002447	341	.033415	-.000000

DOUGLAS AIRCRAFT COMPANY TWO-DIMENSIONAL POTENTIAL FLOW PROGRAM

COMBINED FLOW 2-D OCSEE MOD 3A

ALPHA = .000000 ALPHA 0 = .000003 NO. OF BODIES 2

CL = .000013 CHORD = 1.000000 TOTAL ELEMENTS 354

BODY ID = 2 2-D OCSEE NO. OF ELEMENTS 177

I	X	Y	S	VT	CP	J	SIGMA	VN
165	26.619635	3.960300	.870951	1.001418	-.002838	342	.028879	-.000000
166	27.370065	3.960300	.881275	1.001651	-.003304	343	.024647	-.000000
167	28.120490	3.960300	.891599	1.001896	-.003796	344	.020725	-.000000
168	28.870915	3.960300	.901923	1.002162	-.004328	345	.017120	-.000000
169	29.621345	3.960300	.912246	1.002447	-.004901	346	.013840	-.000000
170	30.371775	3.960300	.922570	1.002752	-.005512	347	.010891	-.000000
171	31.122205	3.960300	.932894	1.003076	-.006161	348	.008281	-.000000
172	31.872635	3.960300	.943218	1.003418	-.006847	349	.006018	-.000000
173	32.623065	3.960300	.953542	1.003779	-.007572	350	.004107	-.000000
174	33.373495	3.960300	.963866	1.004159	-.008335	351	.002556	-.000000
175	34.123925	3.960300	.974190	1.004562	-.009145	352	.001372	-.000000
176	34.874355	3.960300	.984514	1.004987	-.009998	353	.000561	-.000000
177	35.624785	3.960300	.994838	1.005492	-.011013	354	.000129	-.000000

INTEGRATED VALUES

CY = -6.33278 CX = -.00672

CL = -6.33278 CD = -.00672 CM = 28.72285

TOTAL CM = -.00003

FLOWS COMPLETE, T = .00CSECONDS.

POTENTIAL FLOW - - 2-D , 23Y RELEASE U-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NO. 1 OFFBODY POINTS 2-D OCSEE M

I	X(I)	Y(I)	VX	VY	VT	THETA(DEG)
1	-1.000000	-5.000000	.940398	-.091222	.944812	-5.540534
2	-1.000000	-4.473680	.908096	-.095138	.913066	-5.980829
3	-1.000000	-3.947370	.860565	-.079828	.864259	-5.299719
4	-1.000000	-3.421050	.818050	-.020685	.818311	-1.448458
5	-1.000000	-2.894740	.832969	.064662	.835475	4.438910
6	-1.000000	-2.368420	.898062	.111079	.904905	7.050947
7	-1.000000	-1.842110	.962161	.110147	.968445	6.530725
8	-1.000000	-1.315790	1.006348	.085588	1.009981	4.861190
9	-1.000000	-.789470	1.032085	.052754	1.033432	2.926096
10	-1.000000	-.263160	1.043706	.017708	1.043856	.972022
11	-1.000000	.263160	1.043706	-.017708	1.043856	-.972006
12	-1.000000	.789470	1.032085	-.052754	1.033432	-2.926081
13	-1.000000	1.315790	1.006348	-.085588	1.009981	-4.861171
14	-1.000000	1.842110	.962161	-.110147	.968445	-6.530703
15	-1.000000	2.368420	.898062	-.111078	.904905	-7.050918
16	-1.000000	2.894740	.832968	-.064662	.835475	-4.438873
17	-1.000000	3.421050	.818050	.020686	.818312	1.448496
18	-1.000000	3.947370	.860565	.079828	.864259	5.299754
19	-1.000000	4.473680	.908096	.095138	.913066	5.980850
20	-1.000000	5.000000	.940399	.091222	.944813	5.540548
21	-.500000	-5.000000	.954100	-.115935	.961118	-6.928189
22	-.500000	-4.473680	.917347	-.140253	.928007	-8.692607
23	-.500000	-3.947370	.836306	-.157574	.851022	-10.670391
24	-.500000	-3.421050	.694492	-.070695	.698081	-5.812312
25	-.500000	-2.894740	.730347	.148429	.745277	11.487798
26	-.500000	-2.368420	.888537	.206325	.912178	13.072862
27	-.500000	-1.842110	.991049	.171842	1.005837	9.836967
28	-.500000	-1.315790	1.044783	.120370	1.051694	6.572089
29	-.500000	-.789470	1.071424	.070095	1.073715	3.743104
30	-.500000	-.263160	1.082463	.022947	1.082706	1.214406
31	-.500000	.263160	1.082463	-.022946	1.082706	-1.214395
32	-.500000	.789470	1.071424	-.070095	1.073714	-3.743090
33	-.500000	1.315790	1.044782	-.120369	1.051693	-6.572073
34	-.500000	1.842110	.991049	-.171842	1.005837	-9.836944
35	-.500000	2.368420	.888536	-.206325	.912177	-13.072830
36	-.500000	2.894740	.730347	-.148428	.745277	-11.487746
37	-.500000	3.421050	.694492	.070695	.698081	5.812380
38	-.500000	3.947370	.836307	.157575	.851022	10.670426
39	-.500000	4.473680	.917347	.140253	.928007	8.692622
40	-.500000	5.000000	.954100	.115935	.961118	6.928202
41	1.000000	-2.200000	1.378976	.352311	1.423270	14.331767
42	1.000000	-1.968420	1.336399	.281449	1.365714	11.892823
43	1.000000	-1.736840	1.306041	.225456	1.325358	9.794199
44	1.000000	-1.505260	1.283957	.180264	1.296550	7.991920
45	1.000000	-1.273680	1.267708	.147787	1.275724	6.426350
46	1.000000	-1.042110	1.255753	.110808	1.260633	5.042750
47	1.000000	-.810530	1.247075	.082725	1.249815	3.795162
48	1.000000	-.578950	1.241015	.057345	1.242339	2.645655
49	1.000000	-.347370	1.237177	.033740	1.237637	1.562192
50	1.000000	-.115790	1.235310	.011137	1.235360	.516547
51	1.000000	.115790	1.235309	-.011137	1.235360	-.516544
52	1.000000	.347370	1.237177	-.033740	1.237637	-1.562190

POTENTIAL FLOW - - 2-D ; 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

53	1.000000	.578950	1.241015	-.057345	1.242339	-2.645651
54	1.000000	.810530	1.247075	-.082725	1.249815	-3.795157
55	1.000000	1.042110	1.255753	-.110808	1.260633	-5.042747
56	1.000000	1.273680	1.267708	-.142787	1.275724	-6.426346
57	1.000000	1.505260	1.283957	-.180264	1.296550	-7.991917
58	1.000000	1.736840	1.306040	-.225456	1.325357	-9.794197
59	1.000000	1.968420	1.336399	-.281448	1.365714	-11.892817
60	1.000000	2.200000	1.378976	-.352311	1.423270	-14.331765
61	2.096000	-2.100000	1.480821	.034679	1.481227	1.341556
62	2.096000	-1.878950	1.440542	.047232	1.441316	1.877923
63	2.096000	-1.657890	1.407529	.050276	1.408426	2.045698
64	2.096000	-1.436840	1.380746	.048220	1.381588	2.000142
65	2.096000	-1.215790	1.359339	.043280	1.360028	1.823635
66	2.096000	-.994740	1.342565	.036698	1.343066	1.565750
67	2.096000	-.773680	1.329809	.029145	1.330129	1.255551
68	2.096000	-.552630	1.320621	.021081	1.320790	.914520
69	2.096000	-.331580	1.314670	.012732	1.314732	.554850
70	2.096000	-.110530	1.311743	.004260	1.311750	.186055
71	2.096000	.110530	1.311743	-.004260	1.311750	-.186056
72	2.096000	.331580	1.314670	-.012732	1.314732	-.554853
73	2.096000	.552630	1.320621	-.021081	1.320790	-.914521
74	2.096000	.773680	1.329809	-.029145	1.330129	-1.255553
75	2.096000	.994740	1.342565	-.036698	1.343066	-1.565752
76	2.096000	1.215790	1.359339	-.043280	1.360028	-1.823638
77	2.096000	1.436840	1.380746	-.048220	1.381587	-2.000144
78	2.096000	1.657890	1.407528	-.050276	1.408426	-2.045702
79	2.096000	1.878950	1.440541	-.047232	1.441315	-1.877927
80	2.096000	2.100000	1.480821	-.034679	1.481227	-1.341561
81	4.096000	-2.100000	1.332972	-.111111	1.337595	-4.764911
82	4.096000	-1.878950	1.326077	-.095584	1.329517	-4.122787
83	4.096000	-1.657890	1.319601	-.081242	1.322099	-3.522984
84	4.096000	-1.436840	1.313663	-.067984	1.315421	-2.962487
85	4.096000	-1.215790	1.308351	-.055734	1.309537	-2.439251
86	4.096000	-.994740	1.303753	-.044359	1.304507	-1.948670
87	4.096000	-.773680	1.299961	-.033749	1.300399	-1.487147
88	4.096000	-.552630	1.297052	-.023693	1.297268	-1.046507
89	4.096000	-.331580	1.295082	-.014065	1.295158	-.622245
90	4.096000	-.110530	1.294084	-.004669	1.294092	-.206717
91	4.096000	.110530	1.294084	.004669	1.294093	.206714
92	4.096000	.331580	1.295082	.014065	1.295158	.622240
93	4.096000	.552630	1.297052	.023693	1.297268	1.046503
94	4.096000	.773680	1.299961	.033749	1.300399	1.487142
95	4.096000	.994740	1.303753	.044359	1.304507	1.948666
96	4.096000	1.215790	1.308351	.055734	1.309537	2.439248
97	4.096000	1.436840	1.313663	.067984	1.315421	2.962485
98	4.096000	1.657890	1.319601	.081242	1.322100	3.522981
99	4.096000	1.878950	1.326076	.095584	1.329517	4.122785
100	4.096000	2.100000	1.332972	.111111	1.337594	4.764911

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NO. 2 OFFBODY POINTS 2-D OCSEE M

I	X(I)	Y(I)	VX	VY	VT	THETA(DEG)
1	-1.000000	-5.000000	-1.126133	1.792109	2.116561	122.144608
2	-1.000000	-4.473680	-1.122394	2.070846	2.355456	118.457595
3	-1.000000	-3.947370	-.969402	2.425466	2.612015	111.785430
4	-1.000000	-3.421050	-.552617	2.698962	2.754956	101.571471
5	-1.000000	-2.894740	-.040496	2.626535	2.626847	90.883317
6	-1.000000	-2.368420	.242242	2.319998	2.332611	84.039077
7	-1.000000	-1.842110	.299225	2.031496	2.053414	81.620975
8	-1.000000	-1.315790	.248775	1.833512	1.850312	82.273176
9	-1.000000	-.789470	.157962	1.716417	1.723670	84.741879
10	-1.000000	-.263160	.053671	1.662654	1.663520	88.151107
11	-1.000000	.263160	-.053706	1.662656	1.663523	91.850075
12	-1.000000	.789470	-.157995	1.716423	1.723679	95.259194
13	-1.000000	1.315790	-.248809	1.833522	1.850327	97.727820
14	-1.000000	1.842110	-.299256	2.031510	2.053433	98.379821
15	-1.000000	2.368420	-.242269	2.320018	2.332633	95.961527
16	-1.000000	2.894740	.040476	2.626558	2.626870	89.117134
17	-1.000000	3.421050	.552603	2.698985	2.754975	78.428901
18	-1.000000	3.947370	.969393	2.425485	2.612030	68.214908
19	-1.000000	4.473680	1.122387	2.070862	2.355466	61.542742
20	-1.000000	5.000000	1.126125	1.792122	2.116568	57.855755
21	-.500000	-5.000000	-1.365016	1.715638	2.192415	128.506857
22	-.500000	-4.473680	-1.494716	2.059304	2.544584	125.973474
23	-.500000	-3.947370	-1.498321	2.681419	3.071640	119.195547
24	-.500000	-3.421050	-.775024	3.486694	3.571792	102.531990
25	-.500000	-2.894740	.395183	3.158311	3.182939	82.867951
26	-.500000	-2.368420	.673530	2.412461	2.504717	74.400905
27	-.500000	-1.842110	.574280	1.960206	2.042598	73.671050
28	-.500000	-1.315790	.407623	1.717554	1.765261	76.649133
29	-. 00000	-.789470	.239764	1.591228	1.609191	81.431200
30	- 00000	-.263160	.078913	1.536670	1.538695	87.060241
31	- 00000	.263160	-.078952	1.536672	1.538699	92.941186
32	-. 00000	.789470	-.239802	1.591235	1.609203	98.570102
33	- 00000	1.315790	-.407660	1.717566	1.765281	103.351956
34	-. 00000	1.842110	-.574316	1.960223	.042624	106.329783
35	-. 00000	2.368420	-.673563	2.412485	2.504750	105.599661
36	-.500000	2.894740	-.395206	3.158343	.182973	97.132398
37	-.5 000	3.421050	.775015	3.486725	.571820	77.468255
38	-.5 000	3.947370	1.498317	2.681441	.071657	60.804709
39	-.5 000	4.473680	1.494712	2.059320	.544595	54.026808
40	-.5 000	5.000000	1.365011	1.715651	.192422	51.493444
41	1.000000	-2.200000	1.390947	.643206	1.532464	24.816929
42	1.000000	-1.968420	1.148990	.748471	1.371272	33.080894
43	1.000000	-1.736840	.945606	.815093	1.248418	40.760653
44	1.000000	-1.505260	.772499	.858291	1.154737	48.011398
45	1.000000	-1.273680	.622334	.886673	1.083277	54.935949
46	1.000000	-1.042110	.489476	.905495	1.029324	61.606041
47	1.000000	-.810530	.369165	.917963	.989391	68.095338
48	1.000000	-.578950	.257749	.926137	.961334	74.447845
49	1.000000	-.347370	.152303	.931013	.943388	80.709350
50	1.000000	-.115790	.050394	.933216	.934576	86.908986
51	1.000000	.115790	-.050443	.933217	.934579	93.093992
52	1.000000	.347370	-.152353	.931015	.943398	99.293596

POTENTIAL FLOW - - 2-D , 23Y RELEASE D-1-1 FLOW FIELD PLOTS

53	1.000000	.578950	-.257798	.926140	.961351	105.554955
54	1.000000	.810530	-.369156	.917967	.989414	111.907285
55	1.000000	1.042110	-.489527	.905502	1.029354	118.396298
56	1.000000	1.273680	-.622387	.886681	1.083314	125.066113
57	1.000000	1.505260	-.772554	.858301	1.154781	131.990267
58	1.000000	1.736840	-.945661	.815104	1.248467	139.240599
59	1.000000	1.968420	-1.149049	.748485	1.371329	146.919970
60	1.000000	2.200000	-1.391008	.643222	1.532527	155.183500
61	2.096000	-2.100000	.615629	.073672	.620022	6.824145
62	2.096000	-1.878950	.572877	.180631	.600679	17.500276
63	2.096000	-1.657890	.516830	.266599	.581540	27.286255
64	2.096000	-1.436840	.453011	.335645	.563846	36.535491
65	2.096000	-1.215790	.385246	.390299	.548405	45.373299
66	2.096000	-.994740	.315581	.432855	.535682	53.905376
67	2.096000	-.773680	.245448	.464925	.525737	62.169095
68	2.096000	-.552630	.175164	.487890	.518382	70.250645
69	2.096000	-.331580	.104915	.502642	.513475	78.210113
70	2.096000	-.110530	.034898	.510026	.511218	86.085718
71	2.096000	.110530	-.034953	.510026	.511222	93.920423
72	2.096000	.331580	-.104968	.502643	.513486	101.795731
73	2.096000	.552630	-.175219	.487891	.518401	109.754973
74	2.096000	.773680	-.245502	.464926	.525764	117.836095
75	2.096000	.994740	-.315637	.432857	.535716	126.099350
76	2.096000	1.215790	-.385302	.390301	.548446	134.630733
77	2.096000	1.436840	-.453067	.335648	.563852	143.467659
78	2.096000	1.657890	-.516888	.266601	.581592	152.716192
79	2.096000	1.878950	-.572937	.180632	.600737	162.501257
80	2.096000	2.100000	-.615690	.073673	.620082	173.176445
81	4.096000	-2.100000	.129883	.004115	.129948	1.814602
82	4.096000	-1.878950	.127075	.026103	.129728	11.607909
83	4.096000	-1.657890	.120746	.047038	.129585	21.283760
84	4.096000	-1.436840	.111302	.066614	.129713	30.900400
85	4.096000	-1.215790	.099026	.084048	.129885	40.322680
86	4.096000	-.994740	.084241	.099345	.130254	49.703485
87	4.096000	-.773680	.067568	.112123	.130968	58.925870
88	4.096000	-.552630	.049329	.121944	.131543	67.975729
89	4.096000	-.331580	.029975	.128463	.131914	76.865662
90	4.096000	-.110530	.010011	.132036	.132415	85.664248
91	4.096000	.110530	-.010063	.132036	.132419	94.358155
92	4.096000	.331580	-.030029	.128463	.131926	103.156960
93	4.096000	.552630	-.049382	.121943	.131562	112.045826
94	4.096000	.773680	-.067621	.112122	.130934	121.094283
95	4.096000	.994740	-.084294	.099344	.130287	130.314806
96	4.096000	1.215790	-.099079	.084046	.129924	139.692795
97	4.096000	1.436840	-.111357	.066611	.129759	149.113132
98	4.096000	1.657890	-.120801	.047035	.129634	158.725967
99	4.096000	1.878950	-.127129	.026099	.129780	168.398434
100	4.096000	2.100000	-.129937	.004110	.130002	178.188139

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POTENTIAL FLOW - - 2-D , 23Y RELEASE C-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NO. 3 OFFBODY POINTS 2-D OFSEE H

I	X(I)	Y(I)	VX	VY	VT	THETA(DEG)
1	-1.000000	-5.000000	-1.533458	2.352738	2.808357	123.095336
2	-1.000000	-4.473680	-1.467313	2.803262	3.164061	117.628932
3	-1.000000	-3.947370	-1.163603	3.372500	3.567594	109.035802
4	-1.000000	-3.421050	-.436187	3.824670	3.849463	96.506224
5	-1.000000	-2.894740	.480896	3.737815	3.768624	82.668772
6	-1.000000	-2.368420	1.078714	3.240342	3.415178	71.587339
7	-1.000000	-1.842110	1.321491	2.713705	3.018366	64.035345
8	-1.000000	-1.315790	1.373367	2.290765	2.670906	59.056325
9	-1.000000	-.789470	1.339110	1.970987	2.382857	55.807383
10	-1.000000	-.263160	1.265272	1.730774	2.143943	53.831540
11	-1.000000	.263160	1.170382	1.551706	1.943601	52.974382
12	-1.000000	.789470	1.061088	1.424902	1.776584	53.325897
13	-1.000000	1.315790	.940896	1.351957	1.647138	55.164147
14	-1.000000	1.842110	.819633	1.346435	1.576288	58.669329
15	-1.000000	2.368420	.733150	1.429399	1.606452	62.846358
16	-1.000000	2.894740	.768354	1.585184	1.761583	64.140073
17	-1.000000	3.421050	.980819	1.664803	1.932246	59.495524
18	-1.000000	3.947370	1.200685	1.542101	1.954410	52.095550
19	-1.000000	4.473680	1.288395	1.343317	1.861307	46.195548
20	-1.000000	5.000000	1.288427	1.173319	1.742620	42.322869
21	-.500000	-5.000000	-1.924968	2.289304	2.991056	130.058903
22	-.500000	-4.473680	-2.063847	2.846286	3.515794	125.945935
23	-.500000	-3.947370	-2.006237	3.830298	4.323907	117.644690
24	-.500000	-3.421050	-.841035	5.127395	5.195914	99.315145
25	-.500000	-2.894740	1.122777	4.737974	4.869191	76.668307
26	-.500000	-2.368420	1.806864	3.571005	4.002103	63.161414
27	-.500000	-1.842110	1.859260	2.755467	3.324071	55.990366
28	-.500000	-1.315790	1.753796	2.231420	2.838139	51.834243
29	-.500000	-.789470	1.614254	1.875960	2.474882	49.288179
30	-.500000	-.263160	1.468996	1.620713	2.187387	47.811177
31	-.500000	.263160	1.320753	1.430871	1.947250	47.291712
32	-.500000	.789470	1.163417	1.291250	1.738064	47.981126
33	-.500000	1.315790	.986350	1.202634	1.555382	50.642836
34	-.500000	1.842110	.778136	1.189380	1.421309	56.805820
35	-.500000	2.368420	.550596	1.324550	1.434430	67.428067
36	-.500000	2.894740	.474119	1.736124	1.799698	74.725524
37	-.500000	3.421050	1.016978	2.089499	2.323844	64.047391
38	-.500000	3.947370	1.485095	1.707553	2.263017	48.985827
39	-.500000	4.473680	1.511239	1.342807	2.021627	41.622589
40	-.500000	5.000000	1.440393	1.126886	1.828826	38.037716
41	1.000000	-2.200000	3.773601	1.339177	4.004180	19.538782
42	1.000000	-1.968420	3.401274	1.352087	3.660164	21.678990
43	1.000000	-1.736840	3.096975	1.331632	3.371127	23.266649
44	1.000000	-1.505260	2.846071	1.293741	3.126322	24.445164
45	1.000000	-1.273680	2.636259	1.246561	2.916123	25.307242
46	1.000000	-1.042110	2.458196	1.194488	2.733044	25.916073
47	1.000000	-.810530	2.304508	1.139838	2.570990	26.317558
48	1.000000	-.578950	2.169773	1.083749	2.425372	26.541003
49	1.000000	-.347370	2.049749	1.026520	2.292426	26.601835
50	1.000000	-.115790	1.941198	.968090	2.169204	26.505771
51	1.000000	.115790	1.841328	.908131	2.053093	26.252218
52	1.000000	.347370	1.747926	.845942	1.941871	25.825548

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

53	1.000000	.578950	1.658928	.780390	1.833317	25.193158
54	1.000000	.810530	1.572576	.710052	1.725448	24.300199
55	1.000000	1.042110	1.486905	.632927	1.616009	23.057855
56	1.000000	1.273680	1.400158	.546103	1.502888	21.307255
57	1.000000	1.505260	1.310192	.445299	1.383797	18.771498
58	1.000000	1.736840	1.214802	.324070	1.257285	14.936831
59	1.000000	1.968420	1.111621	.172578	1.124938	8.824681
60	1.000000	2.200000	.998880	-.024635	.999184	-1.412754
61	2.096000	-2.100000	3.039026	.152455	3.042848	2.871886
62	2.096000	-1.878950	2.923413	.287712	2.937536	5.620741
63	2.096000	-1.657890	2.804449	.384309	2.830659	7.802962
64	2.096000	-1.436840	2.687391	.452648	2.725245	9.560820
65	2.096000	-1.215790	2.575419	.499124	2.623339	10.968122
66	2.096000	-.994740	2.469968	.528287	2.525833	12.072745
67	2.096000	-.773680	2.371797	.543485	2.433269	12.906232
68	2.096000	-.552630	2.280887	.547283	2.345627	13.492638
69	2.096000	-.331580	2.197160	.541521	2.262909	13.845407
70	2.096000	-.110530	2.120452	.527629	2.185111	13.973055
71	2.096000	.110530	2.050485	.506259	2.112058	13.868802
72	2.096000	.331580	1.987094	.478056	2.043791	13.527164
73	2.096000	.552630	1.930275	.443394	1.980545	12.936730
74	2.096000	.773680	1.880325	.402272	1.922874	12.075685
75	2.096000	.994740	1.837806	.354551	1.871693	10.919400
76	2.096000	1.215790	1.803403	.300069	1.828197	9.446922
77	2.096000	1.436840	1.778924	.238747	1.794873	7.643920
78	2.096000	1.657890	1.766776	.170857	1.775018	5.523659
79	2.096000	1.878950	1.770724	.097831	1.773425	3.162330
80	2.096000	2.100000	1.796355	.023447	1.796508	.747797
81	4.096000	-2.100500	2.282189	-.166848	2.288280	-4.181393
82	4.096000	-1.878950	2.267955	-.119761	2.271115	-3.022742
83	4.096000	-1.657890	2.250721	-.075699	2.251993	-1.926310
84	4.096000	-1.436840	2.230919	-.034942	2.231192	-.897331
85	4.096000	-1.215790	2.209197	.002056	2.209198	.053325
86	4.096000	-.994740	2.186104	.035181	2.186387	.921989
87	4.096000	-.773680	2.162344	.064386	2.163302	1.705530
88	4.096000	-.552630	2.138450	.089616	2.140327	2.399683
89	4.096000	-.331580	2.115103	.110957	2.118011	3.002960
90	4.096000	-.110530	2.092855	.128767	2.096813	3.520789
91	4.096000	.110530	2.072142	.143154	2.077081	3.952013
92	4.096000	.331580	2.053320	.154401	2.059117	4.300293
93	4.096000	.552630	2. 895	.163060	2.043411	4.576949
94	4.096000	.773680	2. 253	.169421	2.030334	4.786613
95	4.096000	.994740	2. 792	.173967	2.020296	4.939828
96	4.096000	1.215790	2. 619	.177302	2.013440	5.051955
97	4.096000	1.436840	2.002036	.179928	2.010105	5.135528
98	4.096000	1.657890	2.002252	.182317	2.010535	5.202787
99	4.096000	1.878950	2.006434	.185144	2.014958	5.272035
100	4.096000	2.100000	2.014658	.188964	2.023500	5.358369

POTENTIAL FLOW - - 2-D , 23Y RELEASE D-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NO. 4 OFFBODY POINTS 2-D OCSEE H

I	X(I)	Y(I)	VX	VY	VT	THETA(DEG)
1	-1.000000	-5.000000	-1.288429	1.173330	1.742628	137.676[illegible]
2	-1.000000	-4.473680	-1.288396	1.343331	1.861318	133.804[illegible]
3	-1.000000	-3.947370	-1.200683	1.542119	1.954423	127.904[illegible]
4	-1.000000	-3.421050	-.980814	1.664825	1.932262	120.5[illegible]
5	-1.000000	-2.894740	-.768342	1.585205	1.761597	115.859249
6	-1.000000	-2.368420	-.733132	1.429417	1.606461	117.152787
7	-1.000000	-1.842110	-.819613	1.346450	1.576291	121.329766
8	-1.000000	-1.315790	-.940868	1.351969	1.647135	124.835007
9	-1.000000	-.789470	-1.061065	1.424909	1.776577	126.673375
10	-1.000000	-.263160	-1.170360	1.551710	1.943591	127.025008
11	-1.000000	.263160	-1.265250	1.730776	2.143931	126.167946
12	-1.000000	.789470	-1.339088	1.970986	2.382843	124.192191
13	-1.000000	1.315790	-1.373346	2.290760	2.670891	120.943329
14	-1.000000	1.842110	-1.321472	2.713698	3.018352	115.964388
15	-1.000000	2.368420	-1.078697	3.240333	3.415164	108.412450
16	-1.000000	2.894740	-.480883	3.737805	3.768611	97.331057
17	-1.000000	3.421050	.436196	3.824660	3.849453	83.493623
18	-1.000000	3.947370	1.163609	3.372492	3.567588	70.964057
19	-1.000000	4.473680	1.467319	2.803256	3.164059	62.370924
20	-1.000000	5.000000	1.533463	2.352733	2.808355	56.904504
21	-.500000	-5.000000	-1.440397	1.126897	1.828836	141.962082
22	-.500000	-4.473680	-1.511244	1.342821	2.021640	138.377199
23	-.500000	-3.947370	-1.485100	1.707574	2.263036	131.013931
24	-.500000	-3.421050	-1.016977	2.089528	2.323870	115.952272
25	-.500000	-2.894740	-.474104	1.736154	1.799723	105.273787
26	-.500000	-2.368420	-.550574	1.324573	1.434442	112.570766
27	-.500000	-1.842110	-.778111	1.189397	1.421310	123.192966
28	-.500000	-1.315790	-.986324	1.202646	1.555375	129.356157
29	-.500000	-.789470	-1.1[illegible]3392	1.291258	1.738053	1[illegible].018097
30	-.500000	-.263160	-1.[illegible]0727	1.430875	1.947235	1[illegible].707645
31	-.500000	.263160	-1.[illegible]8971	1.620714	2.187371	1[illegible].188314
32	-.500000	.789470	-1.[illegible]4229	1.875958	2.474865	1[illegible].711420
33	-.500000	1.315790	-1.[illegible]3772	2.231415	2.838121	1[illegible].165445
34	-.500000	1.842110	-1.[illegible]9238	2.755459	3.324052	1[illegible].009398
35	-.500000	2.368420	-1.806845	3.570992	4.002083	1[illegible].838428
36	-.500000	2.894740	-1.122764	4.737959	4.869174	103.331578
37	-.500000	3.421050	.841041	5.127381	5.195901	80.684759
38	-.500000	3.947370	2.006241	3.830289	4.323901	62.355209
39	-.500000	4.473680	2.063850	2.846280	3.515791	54.053963
40	-.500000	5.000000	1.924972	2.289299	2.991055	49.940971
41	1.000000	-2.200000	-.998836	-.024621	.999139	-178.587978
42	1.000000	-1.968420	-1.111579	.172590	1.124898	171.174381
43	1.000000	-1.736840	-1.214762	.324081	1.257249	165.062235
44	1.000000	-1.505260	-1.310153	.445308	1.383763	161.227623
45	1.000000	-1.273680	-1.400121	.546131	1.502856	158.691942
46	1.000000	-1.042110	-1.486870	.632933	1.615978	156.941439
47	1.000000	-.810530	-1.572541	.710057	1.725418	155.699169
48	1.000000	-.578950	-1.658894	.780394	1.833288	154.806276
49	1.000000	-.347370	-1.747892	.845945	1.941842	154.173937
50	1.000000	-.115790	-1.841294	.908133	2.053063	153.747314
51	1.000000	.115790	-1.941165	.968090	2.169175	153.493822
52	1.000000	.347370	-2.049716	1.026520	2.292396	153.397797

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

53	1.000000	.578950	-2.169740	1.083747	2.425341	153.458672
54	1.000000	.810530	-2.304475	1.139835	2.570959	153.682161
55	1.000000	1.042110	-2.458162	1.194485	2.733012	154.083677
56	1.000000	1.273680	-2.636224	1.246556	2.916090	154.692568
57	1.000000	1.505260	-2.846037	1.293735	3.126288	155.554689
58	1.000000	1.736840	-3.096940	1.331623	3.371092	156.733248
59	1.000000	1.968420	-3.401237	1.352076	3.660126	158.320948
60	1.000000	2.200000	-3.773563	1.339165	4.004140	160.461203
61	2.096000	-2.100000	-1.796309	.023448	1.796462	179.252140
62	2.096000	-1.878950	-1.770680	.097833	1.773381	176.837524
63	2.096000	-1.657890	-1.766734	.170860	1.774976	174.476135
64	2.096000	-1.436840	-1.778882	.238749	1.794833	172.355835
65	2.096000	-1.215790	-1.803363	.300071	1.828158	170.552809
66	2.096000	-.994740	-1.837766	.354553	1.871655	169.080303
67	2.096000	-.773680	-1.880286	.402274	1.922837	167.924023
68	2.096000	-.552630	-1.930236	.443396	1.980507	167.062984
69	2.096000	-.331580	-1.987056	.478057	2.043754	166.472557
70	2.096000	-.110530	-2.050448	.506260	2.112022	166.130936
71	2.096000	.110530	-2.120415	.527629	2.185075	166.026705
72	2.096000	.331580	-2.197123	.541521	2.262873	166.154375
73	2.096000	.552630	-2.280850	.547282	2.345590	166.507168
74	2.096000	.773680	-2.371759	.543484	2.433232	167.093597
75	2.096000	.994740	-2.469930	.528285	2.525795	167.927114
76	2.096000	1.215790	-2.575381	.499122	2.623301	169.031765
77	2.096000	1.436840	-2.687353	.452645	2.725207	170.439102
78	2.096000	1.657890	-2.804409	.384306	2.830619	172.196989
79	2.096000	1.878950	-2.923372	.287708	2.937496	174.379244
80	2.096000	2.100000	-3.038984	.152452	3.042806	177.128136
81	4.096000	-2.100000	-2.014618	.188961	2.023460	174.641626
82	4.096000	-1.878950	-2.006395	.185140	2.014918	174.727953
83	4.096000	-1.657890	-2.002212	.182315	2.010495	174.797188
84	4.096000	-1.436840	-2.001998	.179926	2.010067	174.864435
85	4.096000	-1.215790	-2.005580	.177300	2.013402	174.947998
86	4.096000	-.994740	-2.012754	.173965	2.020258	175.060118
87	4.096000	-.773680	-2.023215	.169420	2.030296	175.213331
88	4.096000	-.552630	-2.036857	.163059	2.043373	175.422995
89	4.096000	-.331580	-2.053282	.154400	2.059079	175.699652
90	4.096000	-.110530	-2.072104	.143154	2.077043	176.047930
91	4.096000	.110530	-2.092817	.128766	2.096774	176.479160
92	4.096000	.331580	-2.115064	.110957	2.117973	176.996988
93	4.096000	.552630	-2.138413	.089616	2.140290	177.600273
94	4.096000	.773680	-2.162306	.064386	2.163264	178.294436
95	4.096000	.994740	-2.186065	.035182	2.186348	179.077986
96	4.096000	1.215790	-2.209159	.002057	2.209160	179.946659
97	4.096000	1.436840	-2.230881	-.034941	2.231155	-179.102673
98	4.096000	1.657890	-2.250683	-.075698	2.251955	-178.073683
99	4.096000	1.878950	-2.267916	-.119760	2.271076	-176.977238
100	4.096000	2.100000	-2.282151	-.166847	2.288242	-175.818579

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

COMBINED FLOW FOR OFFBODY POINTS 2-D OCSEE M

I	X(I)	Y(I)	VX	VY	VT	THETA(DEG)
1	-1.000000	-5.000000	.936227	-.071144	.938926	-4.345569
2	-1.000000	-4.473680	.905050	-.070285	.907775	-4.440580
3	-1.000000	-3.947370	.861196	-.048669	.862570	-3.234515
4	-1.000000	-3.421050	.827321	.016083	.827478	1.113662
5	-1.000000	-2.894740	.854235	.101307	.860221	6.763345
6	-1.000000	-2.368420	.928906	.141907	.939683	8.685791
7	-1.000000	-1.842110	.998610	.133422	1.007483	7.610110
8	-1.000000	-1.315790	1.045744	.101569	1.050665	5.547529
9	-1.000000	-.789470	1.072944	.062051	1.074736	3.309848
10	-1.000000	-.263160	1.085169	.020756	1.085367	1.095785
11	-1.000000	.263160	1.085168	-.020756	1.085367	-1.095771
12	-1.000000	.789470	1.072944	-.062050	1.074736	-3.309832
13	-1.000000	1.315790	1.045744	-.101569	1.050665	-5.547510
14	-1.000000	1.842110	.998609	-.133422	1.007483	-7.610089
15	-1.000000	2.368420	.928905	-.141906	.939682	-8.685762
16	-1.000000	2.894740	.854235	-.101307	.860221	-6.763307
17	-1.000000	3.421050	.827321	-.016082	.827478	-1.113626
18	-1.000000	3.947370	.861196	.048669	.862570	3.234549
19	-1.000000	4.473680	.905050	.070285	.907775	4.440602
20	-1.000000	5.000000	.936227	.071144	.938926	4.345585
21	-.500000	-5.000000	.945851	-.096147	.950725	-5.804258
22	-.500000	-4.473680	.907940	-.114659	.915151	-7.197468
23	-.500000	-3.947370	.827435	-.121438	.836299	-8.349396
24	-.500000	-3.421050	.697487	-.018980	.697745	-1.558756
25	-.500000	-2.894740	.757531	.199530	.783368	14.756255
26	-.500000	-2.368420	.928668	.244567	.960332	14.753990
27	-.500000	-1.842110	1.035946	.198502	1.054792	10.847218
28	-.500000	-1.315790	1.091429	.137883	1.100104	7.200178
29	-.500000	-.789470	1.118709	.080049	1.121569	4.092810
30	-.500000	-.263160	1.129953	.026178	1.130256	1.327171
31	-.500000	.263160	1.129953	-.026178	1.130256	-1.327159
32	-.500000	.789470	1.118709	-.080049	1.121569	-4.092797
33	-.500000	1.315790	1.091428	-.137883	1.100103	-7.200160
34	-.500000	1.842110	1.035946	-.198502	1.054792	-10.847196
35	-.500000	2.368420	.928668	-.244567	.960332	-14.753964
36	-.500000	2.894740	.757531	-.199529	.783368	-14.756209
37	-.500000	3.421050	.697487	.018981	.697745	1.558819
38	-.500000	3.947370	.827435	.121439	.836299	8.349433
39	-.500000	4.473680	.907940	.114659	.915151	7.197487
40	-.500000	5.000000	.945851	.096147	.950726	5.804272
41	1.000000	-2.200000	1.460219	.375527	1.507733	14.422336
42	1.000000	-1.968420	1.413223	.301528	1.445032	12.044126
43	1.000000	-1.736840	1.379441	.242608	1.400612	9.974841
44	1.000000	-1.505260	1.354710	.194707	1.368631	8.178878
45	1.000000	-1.273680	1.336421	.154711	1.345346	6.603448
46	1.000000	-1.042110	1.322911	.120368	1.328376	5.198863
47	1.000000	-.810530	1.313075	.090041	1.316158	3.922789
48	1.000000	-.578950	1.306192	.062509	1.307687	2.739862
49	1.000000	-.347370	1.301825	.036815	1.302346	1.619844
50	1.000000	-.115790	1.299700	.012158	1.299757	.535950
51	1.000000	.115790	1.299700	-.012158	1.299757	-.535946
52	1.000000	.347370	1.301825	-.036814	1.302346	-1.619840

POTENTIAL FLOW - - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

53	1.000000	.578950	1.306192	-.062509	1.307686	-2.739857
54	1.000000	.810530	1.313075	-.090041	1.316158	-3.922782
55	1.000000	1.042110	1.322911	-.120368	1.328376	-5.198859
56	1.000000	1.273680	1.336420	-.154711	1.345346	-6.603443
57	1.000000	1.505260	1.354710	-.194707	1.368631	-8.178873
58	1.000000	1.736840	1.379440	-.242608	1.400612	-9.974836
59	1.000000	1.968420	1.413222	-.301527	1.445032	-12.044119
60	1.000000	2.200000	1.460218	-.375527	1.507733	-14.422332
61	2.096000	-2.100000	1.563134	.036875	1.563569	1.351390
62	2.096000	-1.878950	1.520450	.050464	1.521288	1.900972
63	2.096000	-1.657890	1.485345	.053910	1.486323	2.078601
64	2.096000	-1.436840	1.456776	.051861	1.457699	2.038873
65	2.096000	-1.215790	1.433880	.046669	1.434640	1.864159
66	2.096000	-.994740	1.415897	.039656	1.416452	1.604287
67	2.096000	-.773680	1.402194	.031549	1.402549	1.288936
68	2.096000	-.552630	1.392308	.022849	1.392496	.940199
69	2.096000	-.331580	1.385899	.013812	1.385968	.570997
70	2.096000	-.110530	1.382746	.004623	1.382753	.191576
71	2.096000	.110530	1.382746	-.004623	1.382753	-.191576
72	2.096000	.331580	1.385899	-.013812	1.385968	-.570997
73	2.096000	.552630	1.392308	-.022849	1.392496	-.940198
74	2.096000	.773680	1.402194	-.031549	1.402549	-1.288938
75	2.096000	.994740	1.415897	-.039656	1.416452	-1.604288
76	2.096000	1.215790	1.433881	-.046669	1.434640	-1.864161
77	2.096000	1.436840	1.456776	-.051861	1.457699	-2.038875
78	2.096000	1.657890	1.485345	-.053910	1.486323	-2.078603
79	2.096000	1.878950	1.520450	-.050464	1.521288	-1.900975
80	2.096000	2.100000	1.563134	-.036875	1.563569	-1.351394
81	4.096000	-2.100000	1.406117	-.117168	1.410991	-4.763291
82	4.096000	-1.878950	1.398840	-.100775	1.402465	-4.120569
83	4.096000	-1.657890	1.392000	-.085634	1.394631	-3.520318
84	4.096000	-1.436840	1.385721	-.071642	1.387572	-2.959547
85	4.096000	-1.215790	1.380100	-.058717	1.381348	-2.436217
86	4.096000	-.994740	1.375731	-.046721	1.376024	-1.945783
87	4.096000	-.773680	1.371213	-.035537	1.371673	-1.484566
88	4.096000	-.552630	1.368129	-.024943	1.368357	-1.044491
89	4.096000	-.331580	1.366041	-.014805	1.366122	-.620938
90	4.096000	-.110530	1.364985	-.004914	1.364994	-.206261
91	4.096000	.110530	1.364985	.004914	1.364994	.206256
92	4.096000	.331580	1.366042	.014805	1.366122	.620935
93	4.096000	.552630	1.368129	.024943	1.368357	1.044489
94	4.096000	.773680	1.371213	.035537	1.371673	1.484563
95	4.096000	.994740	1.375231	.046721	1.376024	1.945779
96	4.096000	1.215790	1.380100	.058717	1.381348	2.436213
97	4.096000	1.436840	1.385721	.071641	1.387572	2.959545
98	4.096000	1.657890	1.392000	.085634	1.394631	3.520315
99	4.096000	1.878950	1.398840	.100775	1.402465	4.120567
100	4.096000	2.100000	1.406118	.117168	1.410991	4.763289

POTENTIAL FLOW - - 2-D . 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NO. 1 OFFBODY POINTS 2-D OCSEE M

I	X(I)	Y(I)	VX	VY	VT	THETA(DEG)
1	12.009000	-3.100000	.933406	-.006683	.933430	-.410225
2	12.009000	-2.773680	.939955	-.012256	.940035	-.747013
3	12.009000	-2.447370	.945969	-.014546	.946080	-.880982
4	12.009000	-2.121050	.951180	-.015042	.951299	-.905977
5	12.009000	-1.794740	.955629	-.014265	.955735	-.855220
6	12.009000	-1.468420	.959313	-.012611	.959396	-.753178
7	12.009000	-1.142110	.962241	-.010378	.962297	-.617912
8	12.009000	-.815790	.964421	-.007692	.964452	-.456987
9	12.009000	-.489470	.965867	-.004714	.965879	-.279646
10	12.009000	-.163160	.966576	-.001571	.966578	-.093104
11	12.009000	.163160	.966576	.001571	.966578	.093125
12	12.009000	.489470	.965867	.004714	.965879	.279662
13	12.009000	.815790	.964421	.007693	.964452	.457005
14	12.009000	1.142110	.962241	.010378	.962297	.617928
15	12.009000	1.468420	.959313	.012612	.959396	.753196
16	12.009000	1.794740	.955629	.014266	.955735	.855243
17	12.009000	2.121050	.951180	.015042	.951299	.906000
18	12.009000	2.447370	.945969	.014547	.946080	.880999
19	12.009000	2.773680	.939955	.012256	.940035	.747035
20	12.009000	3.100000	.933406	.006684	.933430	.410250

POTENTIAL FLOW - - 2-Γ , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NO. 2 OFFBODY POINTS 2-D QCSEE M

I	X(I)	Y(I)	VX	VY	VT	THETA(DEG)
1	12.009000	-3.100000	.042654	.028470	.051282	33.721675
2	12.009000	-2.773680	.026082	.024554	.035821	43.270887
3	12.009000	-2.447370	.018308	.022547	.029044	50.923736
4	12.009000	-2.121050	.013537	.020625	.024671	56.720114
5	12.009000	-1.794740	.010113	.019444	.021917	62.521472
6	12.009000	-1.468420	.007339	.018508	.019910	68.370049
7	12.009000	-1.142110	.005573	.017928	.018774	72.733020
8	12.009000	-.815790	.003869	.017516	.017938	77.545349
9	1 .009000	-.489470	.002310	.017285	.017439	82.387851
10	1 .009000	-.163160	.000869	.017230	.017252	87.111159
11	1 .009000	.163160	-.000901	.017228	.017252	92.992550
12	1 .009000	.489470	-.002340	.017283	.017441	97.711426
13	1 .009000	.815790	-.003900	.017513	.017942	102.555872
14	1 .009000	1.142110	-.005604	.017925	.018780	107.361099
15	1 .009000	1.468420	-.007370	.018501	.019915	111.719223
16	1 .009000	1.794740	-.010144	.019439	.021926	117.558303
17	1 .009000	2.121050	-.013568	.020618	.024682	123.347213
18	1 .009000	2.447370	-.018339	.022539	.029057	129.134394
19	12.009000	2.773680	-.026115	.024547	.035841	136.772654
20	12.009000	3.100000	-.042686	.028465	.051307	146.302763

POTENTIAL FLOW - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NO. 3 OFFBODY POINTS 2-D QCSEE M

I	X(I)	Y(I)	VX	VY	VT	THETA(DEG)
1	12.009000	-3.100000	1.457999	-.025921	1.458229	-1.018524
2	12.009000	-2.773680	1.484513	-.028967	1.484796	-1.117850
3	1 [illegible]009000	-2.447370	1.501085	-.029924	1.501383	-1.142042
4	1 [illegible]009[illegible]0	-2.121050	1.513790	-.028480	1.514058	-1.077804
5	1 .009[illegible]0	-1.794740	1.523809	-.025842	1.524028	-.971585
6	1 .009 [illegible]0	-1.468420	1.531878	-.022308	1.532041	-.834302
7	1 .009[illegible]0	-1.142110	1.537702	-.017636	1.537803	-.657090
8	1 [illegible]009 0	-.815790	1.542149	-.012600	1.542200	-.468131
9	1 .009 [illegible]0	-.489470	1.545133	-.007229	1.545150	-.268057
10	1 .009000	-.163160	1.546791	-.001686	1.546792	-.062437
11	1 [illegible]009000	.163160	1.547269	.004167	1.547275	.154307
12	12.009000	.489470	1.546	.009781	1.546220	.362427
13	12.009000	.815790	1.543	.015092	1.544009	.560038
14	12.009000	1.142110	1.540	.019914	1.540506	.740680
15	12.009000	1.468420	1.535	.024109	1.535712	.899509
16	12.009000	1.794740	1.529	.027110	1.529845	1.015384
17	12.009000	2.121050	1.522316	.028790	1.522588	1.083458
18	12.009000	2.447370	1.513618	.028611	1.513889	1.082914
19	12.009000	2.773680	1.503856	.025287	1.504068	.963311
20	12.009000	3.100000	1.492318	.016008	1.492404	.614577

POTENTIAL FLOW - 2-D , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

INDIVIDUAL FLOW NO. 4 OFFBODY POINTS 2-D QCSEE M

I	X(I)	Y(I)	VX	VY	VT	THETA(DEG)
1	12.009000	-3.100000	-1.492291	.016006	1.492377	179.385496
2	12.009000	-2.773680	-1.503830	.025285	1.504042	179.036716
3	12.009000	-2.447370	-1.513592	.028611	1.513863	178.917093
4	12.009000	-2.121050	-1.522291	.028790	1.522563	178.916548
5	12.009000	-1.794740	-1.529579	.027110	1.529819	178.984604
6	12.009000	-1.468420	-1.535497	.024109	1.535687	179.100479
7	12.009000	-1.142110	-1.540352	.019914	1.540480	179.259302
8	12.009000	-.815790	-1.543909	.015093	1.543983	179.439913
9	12.009000	-.489470	-1.546163	.009783	1.546194	179.637491
10	12.009000	-.163160	-1.547242	.004169	1.547248	179.845631
11	12.009000	.163160	-1.546765	-.001683	1.546766	-179.937668
12	12.009000	.489470	-1.545105	-.007226	1.545122	-179.732058
13	12.009000	.815790	-1.542122	-.012598	1.542174	-179.531948
14	12.009000	1.142110	-1.537674	-.017631	1.537775	-179.343056
15	12.009000	1.468420	-1.531851	-.022303	1.532013	-179.165852
16	12.009000	1.794740	-1.523780	-.025838	1.523999	-179.028563
17	12.009000	2.121050	-1.513762	-.028476	1.514030	-178.922316
18	12.009000	2.447370	-1.501055	-.029920	1.501353	-178.858076
19	12.009000	2.773680	-1.484484	-.028962	1.484766	-178.882298
20	12.009000	3.100000	-1.457970	-.025916	1.458200	-178.981646

POTENTIAL FLOW - - 2-C , 23Y RELEASE 0-1-1 FLOW FIELD PLOTS

COMBINED FLOW FOR OFFBODY POINTS 2-D OCSEE M

I	X(I)	Y(I)	VX	VY	VT	THETA(DEG)
1	12.009000	-3.100000	.983629	-.007396	.983657	-.430833
2	12.009000	-2.773680	.990827	-.013179	.990914	-.762048
3	12.009000	-2.447370	.997288	-.015543	.997409	-.892878
4	12.009000	-2.121050	1.002864	-.016017	1.002992	-.914985
5	12.009000	-1.794740	1.007607	-.015167	1.007722	-.862358
6	12.009000	-1.468420	1.011530	-.013401	1.011618	-.759049
7	12.009000	-1.142110	1.014640	-.011017	1.014699	-.622095
8	12.009000	-.815790	1.016956	-.008164	1.016989	-.459943
9	12.009000	-.489470	1.018491	-.005004	1.018503	-.281485
10	12.009000	-.163160	1.019247	-.001670	1.019248	-.093895
11	12.009000	.163160	1.019247	.001671	1.019248	.093907
12	12.009000	.489470	1.018491	.005004	1.018503	.281496
13	12.009000	.815790	1.016956	.008164	1.016989	.459955
14	12.009000	1.142110	1.014640	.011017	1.014699	.622109
15	12.009000	1.468420	1.011530	.013402	1.011619	.759065
16	12.009000	1.794740	1.007607	.015167	1.007722	.862370
17	12.009000	2.121050	1.002864	.016017	1.002992	.915000
18	12.009000	2.447370	.997288	.015543	.997409	.892896
19	12.009000	2.773680	.990827	.013179	.990914	.762068
20	12.009000	3.100000	.983629	.007397	.983657	.430858

OFFBODY POINTS COMPLETE, T = .000 SECONDS,

@FIN

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@XQT    .PROGC
 2-D QCSEE MOD 3A
 354 177 177 120   1   1    0    0    0
      .000      .000      .000 145.530      .000      .790      .300      .000 541.5702049.900
      .000      .000      .000    .000      .000      .000      .000  12.513      .000 900.000

      16.000    -2.000     1.000     8.000    -4.000    -1.000
       2.096    -2.279     2.278
        .000      .000      .000
      -3.326     3.326      .000
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2-D UCSEE MOD 3A

2-D COMBINATION SOLUTION

COMPRESSIBLE VERSION

COMBINATION OF THE FOLLOWING BASIC SOLUTIONS
1. UNIFORM AXIAL
2. UNIFORM CROSSFLOW
3. VORTICITY ABOUT LOWER SHROUD
4. VORTICITY ABOUT UPPER SHROUD

	VELOCITY	MACH NO.	DYNAMIC PRESSURE INC	DYNAMIC PRESSURE COMP	PRESSURE RATIO INC	PRESSURE RATIO COMP	DENSITY RATIO
CONTROL	8.495+02	7.900-01	7.895+02	5.933+02	6.149-01	6.625-01	7.452-01
FREE STREAM	1.455+02	1.278-01	2.317+01	2.317+01	9.887-01	9.886-01	9.919-01

ALPHA	VINF/VC	VSONIC	VSONICC	WDOTCR	WDOTLCR	WDOTUCR
0.000	1.713-01	6.600+02	1.341+03	1.799+01	0.000	0.000

TSTAT	PSTAT	PSTATC	ASTAT	RHOSTAT	WDOTC	WDOTL	WDOTU
5.398+02	2.327+03	2.027+03	1.139+03	2.189-03	1.706+01	0.000	0.000

VIC	VICL	VICU
6.331+02	0.000	0.000

TTOT	PTOT	PTOTC	ATOT	RHOTOT	THET	DEL
5.416+02	2.050+03	2.050+03	1.141+03	2.206-03	1.044+00	9.687-01

XRI1	YRI1	XRI2	YRI2	XTEST	YCL	YCU	END
0.000	-3.326+00	0.000	3.326+00	2.396+00	-2.278+00	2.278+00	1.000+00

XTEST1	YCL1	YCU1	XTEST2	YCL2	YCU2	HUB-TIP L	HUB-TIP U
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

P-S CUTOFF L	P-S CUTOFF HUB	P-S CUTOFF U
0.000	0.000	1.251+01

NT	NP	NSI	NH	KND	IR	NX	ICOMP1	IHUB
354	120	177	177	0	1	1	0	0

	V1	V2	V3	V4
CONTROL	1.373+00	-2.825-05	2.212+00	-2.212+00

A	B	C	VINFP
1.443+02	0.000	9.830+01	1.443+02

ORIGINAL PAGE IS
OF POOR QUALITY

LOWER SHROUD
ON-BODY POINTS

I	X	Y	S	VCOM	VBAR	MACH	CP	RB/RT	PS/PT
1	3.562+01	-3.963+00	-3.581+01	-1.313+01	1.443+02	1.152-02	9.998-01	.9919	.9999
2	3.487+01	-3.963+00	-3.506+01	-7.701+01	1.443+02	6.755-02	7.280-01	.9919	.9968
3	3.412+01	-3.963+00	-3.431+01	-9.723+01	1.443+02	8.531-02	5.617-01	.9919	.9949
4	3.337+01	-3.963+00	-3.356+01	-1.073+02	1.443+02	9.416-02	4.645-01	.9919	.9938
5	3.262+01	-3.963+00	-3.280+01	-1.129+02	1.443+02	9.910-02	4.061-01	.9919	.9932
6	3.187+01	-3.963+00	-3.205+01	-1.162+02	1.443+02	1.019-01	3.711-01	.9919	.9928
7	3.112+01	-3.963+00	-3.130+01	-1.179+02	1.443+02	1.035-01	3.513-01	.9919	.9925
8	3.037+01	-3.963+00	-3.055+01	-1.188+02	1.443+02	1.043-01	3.423-01	.9919	.9924
9	2.962+01	-3.963+00	-2.980+01	-1.190+02	1.443+02	1.044-01	3.398-01	.9919	.9924
10	2.887+01	-3.963+00	-2.905+01	-1.187+02	1.443+02	1.042-01	3.428-01	.9919	.9924
11	2.812+01	-3.963+00	-2.830+01	-1.181+02	1.443+02	1.036-01	3.497-01	.9919	.9925
12	2.737+01	-3.963+00	-2.755+01	-1.172+02	1.443+02	1.029-01	3.592-01	.9919	.9926
13	2.662+01	-3.963+00	-2.680+01	-1.162+02	1.443+02	1.020-01	3.735-01	.9919	.9928
14	2.587+01	-3.963+00	-2.605+01	-1.153+02	1.443+02	1.009-01	3.836-01	.9919	.9929
15	2.512+01	-3.963+00	-2.530+01	-1.137+02	1.443+02	9.982-02	3.973-01	.9919	.9931
16	2.437+01	-3.963+00	-2.455+01	-1.124+02	1.443+02	9.862-02	4.119-01	.9919	.9932
17	2.362+01	-3.963+00	-2.380+01	-1.109+02	1.443+02	9.735-02	4.271-01	.9919	.9934
18	2.287+01	-3.963+00	-2.305+01	-1.095+02	1.443+02	9.606-02	4.423-01	.9919	.9936
19	2.212+01	-3.963+00	-2.230+01	-1.080+02	1.443+02	9.475-02	4.576-01	.9919	.9937
20	2.137+01	-3.963+00	-2.155+01	-1.064+02	1.443+02	9.339-02	4.733-01	.9919	.9939
21	2.062+01	-3.963+00	-2.080+01	-1.049+02	1.443+02	9.203-02	4.887-01	.9919	.9941
22	1.987+01	-3.963+00	-2.005+01	-1.033+02	1.443+02	9.067-02	5.039-01	.9919	.9943
23	1.912+01	-3.963+00	-1.930+01	-1.018+02	1.443+02	8.929-02	5.192-01	.9919	.9944
24	1.836+01	-3.963+00	-1.855+01	-1.001+02	1.443+02	8.788-02	5.345-01	.9919	.9946
25	1.761+01	-3.963+00	-1.780+01	-9.855+01	1.443+02	8.647-02	5.495-01	.9919	.9948
26	1.686+01	-3.963+00	-1.705+01	-9.689+01	1.443+02	8.531-02	5.648-01	.9919	.9950
27	1.611+01	-3.963+00	-1.630+01	-9.523+01	1.443+02	8.355-02	5.799-01	.9919	.9951
28	1.536+01	-3.963+00	-1.555+01	-9.332+01	1.443+02	8.188-02	5.968-01	.9919	.9953
29	1.461+01	-3.963+00	-1.480+01	-9.076+01	1.443+02	7.963-02	6.191-01	.9919	.9956
30	1.393+01	-3.963+00	-1.411+01	-9.509+01	1.443+02	8.343-02	5.811-01	.9919	.9951
31	1.336+01	-3.963+00	-1.354+01	-9.826+01	1.443+02	8.622-02	5.521-01	.9919	.9948
32	1.288+01	-3.963+00	-1.307+01	-1.009+02	1.443+02	8.856-02	5.272-01	.9919	.9945
33	1.249+01	-3.963+00	-1.267+01	-1.033+02	1.443+02	9.061-02	5.047-01	.9919	.9943
34	1.216+01	-3.963+00	-1.234+01	-1.056+02	1.443+02	9.265-02	4.818-01	.9919	.9940
35	1.186+01	-3.963+00	-1.204+01	-1.034+02	1.443+02	9.074-02	5.031-01	.9919	.9943
36	1.156+01	-3.963+00	-1.174+01	-1.018+02	1.443+02	8.934-02	5.186-01	.9919	.9944
37	1.126+01	-3.963+00	-1.144+01	-1.006+02	1.443+02	8.830-02	5.300-01	.9919	.9946
38	1.095+01	-3.963+00	-1.114+01	-9.996+01	1.443+02	8.771-02	5.363-01	.9919	.9946
39	1.065+01	-3.963+00	-1.084+01	-9.960+01	1.443+02	8.743-02	5.396-01	.9919	.9947
40	1.035+01	-3.963+00	-1.053+01	-9.967+01	1.443+02	8.745-02	5.390-01	.9919	.9947
41	1.005+01	-3.963+00	-1.023+01	-9.990+01	1.443+02	8.766-02	5.368-01	.9919	.9946
42	9.749+00	-3.963+00	-9.931+00	-1.003+02	1.443+02	8.801-02	5.331-01	.9919	.9946
43	9.448+00	-3.963+00	-9.630+00	-1.008+02	1.443+02	8.847-02	5.281-01	.9919	.9945
44	9.147+00	-3.963+00	-9.329+00	-1.013+02	1.443+02	8.888-02	5.236-01	.9919	.9945
45	8.845+00	-3.963+00	-9.027+00	-1.018+02	1.443+02	8.934-02	5.186-01	.9919	.9944
46	8.544+00	-3.963+00	-8.726+00	-1.022+02	1.443+02	8.971-02	5.146-01	.9919	.9944
47	8.243+00	-3.963+00	-8.425+00	-1.025+02	1.443+02	8.998-02	5.115-01	.9919	.9944
48	7.942+00	-3.963+00	-8.123+00	-1.028+02	1.443+02	9.021-02	5.091-01	.9919	.9943
49	7.640+00	-3.963+00	-7.822+00	-1.029+02	1.443+02	9.029-02	5.082-01	.9919	.9943

I	X	Y	S	VCOM	VBAR	MACH	CP	RB/RT	PS/PT
50	7.339+00	-3.960+00	-7.521+00	-1.029+02	1.443+02	9.032-02	5.078-01	.9919	.9943
51	7.038+00	-3.960+00	-7.220+00	-1.028+02	1.443+02	9.017-02	5.095-01	.9919	.9943
52	6.736+00	-3.960+00	-6.918+00	-1.025+02	1.443+02	8.997-02	5.117-01	.9919	.9944
53	6.435+00	-3.960+00	-6.617+00	-1.021+02	1.443+02	8.963-02	5.155-01	.9919	.9944
54	6.134+00	-3.960+00	-6.316+00	-1.016+02	1.443+02	8.916-02	5.205-01	.9919	.9945
55	5.833+00	-3.960+00	-6.014+00	-1.009+02	1.443+02	8.858-02	5.269-01	.9919	.9945
56	5.531+00	-3.960+00	-5.713+00	-1.001+02	1.443+02	8.784-02	5.348-01	.9919	.9946
57	5.233+00	-3.960+00	-5.412+00	-9.913+01	1.443+02	8.698-02	5.440-01	.9919	.9947
58	4.929+00	-3.960+00	-5.111+00	-9.799+01	1.443+02	8.598-02	5.547-01	.9919	.9948
59	4.627+00	-3.960+00	-4.809+00	-9.663+01	1.443+02	8.479-02	5.671-01	.9919	.9950
60	4.326+00	-3.960+00	-4.508+00	-9.508+01	1.443+02	8.343-02	5.812-01	.9919	.9951
61	4.025+00	-3.960+00	-4.207+00	-9.330+01	1.443+02	8.186-02	5.970-01	.9919	.9953
62	3.724+00	-3.960+00	-3.905+00	-9.127+01	1.463+02	8.008-02	6.148-01	.9917	.9955
63	3.422+00	-3.960+00	-3.604+00	-8.900+01	1.560+02	7.808-02	6.346-01	.9905	.9957
64	3.121+00	-3.960+00	-3.303+00	-8.649+01	1.667+02	7.587-02	6.558-01	.9891	.9960
65	2.820+00	-3.960+00	-3.002+00	-8.433+01	1.784+02	7.398-02	6.737-01	.9875	.9962
66	2.554+00	-3.958+00	-2.736+00	-8.077+01	1.898+02	7.085-02	7.019-01	.9858	.9965
67	2.330+00	-3.952+00	-2.511+00	-7.587+01	2.004+02	6.655-02	7.383-01	.9841	.9969
68	2.117+00	-3.942+00	-2.298+00	-7.046+01	2.113+02	6.181-02	7.758-01	.9823	.9973
69	1.914+00	-3.929+00	-2.096+00	-6.429+01	2.225+02	5.638-02	8.151-01	.9803	.9978
70	1.723+00	-3.912+00	-1.903+00	-5.723+01	2.341+02	5.019-02	8.555-01	.9781	.9982
71	1.541+00	-3.894+00	-1.720+00	-4.922+01	2.460+02	4.316-02	8.954-01	.9758	.9987
72	1.368+00	-3.873+00	-1.546+00	-4.003+01	2.581+02	3.510-02	9.337-01	.9732	.9991
73	1.204+00	-3.850+00	-1.381+00	-2.945+01	2.705+02	2.582-02	9.679-01	.9704	.9995
74	1.049+00	-3.825+00	-1.224+00	-1.714+01	2.833+02	1.503-02	9.944-01	.9674	.9998
75	9.028-01	-3.799+00	-1.075+00	-2.655+00	2.963+02	2.328-03	1.008+00	.9641	1.0000
76	7.640-01	-3.773+00	-9.332-01	1.477+01	3.096+02	1.295-02	9.980-01	.9605	.9999
77	6.330-01	-3.738+00	-7.984-01	3.621+01	3.233+02	3.175-02	9.482-01	.9567	.9993
78	5.095-01	-3.703+00	-6.701-01	6.352+01	3.373+02	5.571-02	8.250-01	.9525	.9978
79	3.935-01	-3.665+00	-5.479-01	9.956+01	3.518+02	8.736-02	5.608-01	.9479	.9947
80	2.853-01	-3.621+00	-4.313-01	1.499+02	3.669+02	1.317-01	-7.142-04	.9428	.9880
81	1.871-01	-3.571+00	-3.212-01	2.242+02	3.825+02	1.973-01	-1.233+00	.9372	.9732
82	1.025-01	-3.513+00	-2.182-01	3.398+02	3.985+02	3.006-01	-4.108+00	.9311	.9392
83	4.012-02	-3.445+00	-1.266-01	5.081+02	4.139+02	4.546-01	-1.036+01	.9248	.8678
84	8.150-03	-3.369+00	-4.297-02	6.583+02	4.275+02	5.974-01	-1.794+01	.9188	.7856
85	3.235-03	-3.285+00	4.130-02	7.141+02	4.391+02	6.522-01	-2.116+01	.9136	.7514
86	1.544-02	-3.205+00	1.220-01	7.455+02	4.500+02	6.835-01	-2.332+01	.9083	.7315
87	3.746-02	-3.132+00	1.984-01	7.844+02	4.605+02	7.228-01	-2.544+01	.9030	.7062
88	6.650-02	-3.065+00	2.703-01	8.155+02	4.704+02	7.547-01	-2.741+01	.8978	.6855
89	1.030-01	-3.003+00	3.431-01	8.383+02	4.802+02	7.783-01	-2.884+01	.8924	.6702
90	1.489-01	-2.940+00	4.215-01	8.574+02	4.906+02	7.982-01	-3.000+01	.8864	.6572
91	2.044-01	-2.876+00	5.060-01	8.731+02	5.015+02	8.147-01	-3.090+01	.8797	.6464
92	2.687-01	-2.814+00	5.954-01	8.865+02	5.126+02	8.293-01	-3.163+01	.8726	.6371
93	3.421-01	-2.753+00	6.905-01	8.977+02	5.239+02	8.409-01	-3.216+01	.8649	.6294
94	4.263-01	-2.694+00	7.937-01	9.084+02	5.354+02	8.524-01	-3.263+01	.8565	.6220
95	5.217-01	-2.635+00	9.055-01	9.192+02	5.473+02	8.640-01	-3.306+01	.8472	.6144
96	6.286-01	-2.579+00	1.026+00	9.307+02	5.593+02	8.765-01	-3.351+01	.8372	.6064
97	7.478-01	-2.525+00	1.157+00	9.433+02	5.713+02	8.932-01	-3.398+01	.8263	.5976
98	8.796-01	-2.474+00	1.299+00	9.569+02	5.831+02	9.052-01	-3.449+01	.8145	.5880

I	X	Y	S	VCOM	VBAR	MACH	CP	RB/RT	PS/PT
99	1.025+00	-2.425+00	1.451+00	9.715+02	5.944+02	9.213-01	-3.532+01	.8321	.5777
100	1.184+00	-2.384+00	1.616+00	9.865+02	6.051+02	9.379-01	-3.553+01	.7891	.5671
101	1.358+00	-2.345+00	1.794+00	1.000+03	6.147+02	9.535-01	-3.595+01	.7760	.5572
102	1.548+00	-2.315+00	1.986+00	1.011+03	6.228+02	9.650-01	-3.610+01	.7636	.5500
103	1.754+00	-2.293+00	2.194+00	1.012+03	6.288+02	9.664-01	-3.569+01	.7532	.5492
104	1.979+00	-2.281+00	2.419+00	9.908+02	6.322+02	9.428-01	-3.389+01	.7470	.5640
105	2.219+00	-2.279+00	2.659+00	9.550+02	6.329+02	9.031-01	-3.136+01	.7457	.5893
106	2.466+00	-2.283+00	2.906+00	9.256+02	6.319+02	8.709-01	-2.948+01	.7477	.6100
107	2.714+00	-2.290+00	3.154+00	9.033+02	6.299+02	8.469-01	-2.817+01	.7514	.6255
108	2.965+00	-2.300+00	3.405+00	8.828+02	6.270+02	8.250-01	-2.735+01	.7565	.6397
109	3.217+00	-2.314+00	3.658+00	8.627+02	6.232+02	8.038-01	-2.632+01	.7629	.6535
110	3.471+00	-2.331+00	3.913+00	8.427+02	6.187+02	7.828-01	-2.502+01	.7701	.6672
111	3.728+00	-2.351+00	4.170+00	8.225+02	6.134+02	7.619-01	-2.404+01	.7779	.6808
112	3.985+00	-2.374+00	4.429+00	8.023+02	6.074+02	7.411-01	-2.307+01	.7860	.6944
113	4.245+00	-2.400+00	4.689+00	7.822+02	6.009+02	7.205-01	-2.212+01	.7943	.7077
114	4.506+00	-2.428+00	4.952+00	7.623+02	5.940+02	7.004-01	-2.119+01	.8026	.7207
115	4.768+00	-2.459+00	5.216+00	7.427+02	5.865+02	6.807-01	-2.027+01	.8108	.7333
116	5.032+00	-2.491+00	5.481+00	7.235+02	5.789+02	6.615-01	-1.939+01	.8188	.7455
117	5.296+00	-2.525+00	5.749+00	7.048+02	5.710+02	6.430-01	-1.853+01	.8265	.7572
118	5.562+00	-2.562+00	6.017+00	6.867+02	5.629+02	6.252-01	-1.771+01	.8340	.7684
119	5.830+00	-2.600+00	6.287+00	6.693+02	5.548+02	6.082-01	-1.692+01	.8411	.7790
120	6.097+00	-2.639+00	6.557+00	6.526+02	5.466+02	5.919-01	-1.618+01	.8478	.7690
121	6.366+00	-2.678+00	6.829+00	6.366+02	5.385+02	5.764-01	-1.546+01	.8542	.7984
122	6.635+00	-2.719+00	7.101+00	6.213+02	5.304+02	5.617-01	-1.480+01	.8602	.8072
123	6.905+00	-2.760+00	7.374+00	6.068+02	5.225+02	5.478-01	-1.417+01	.8658	.8155
124	7.175+00	-2.801+00	7.647+00	5.931+02	5.149+02	5.347-01	-1.358+01	.8711	.8231
125	7.445+00	-2.842+00	7.921+00	5.803+02	5.074+02	5.225-01	-1.303+01	.8760	.8302
126	7.715+00	-2.883+00	8.193+00	5.682+02	5.003+02	5.110-01	-1.252+01	.8805	.8368
127	7.984+00	-2.923+00	8.466+00	5.569+02	4.934+02	5.004-01	-1.235+01	.8847	.8428
128	8.253+00	-2.962+00	8.737+00	5.464+02	4.869+02	4.905-01	-1.162+01	.8885	.8483
129	8.521+00	-3.000+00	9.008+00	5.367+02	4.807+02	4.814-01	-1.122+01	.8921	.8534
130	8.788+00	-3.035+00	9.277+00	5.277+02	4.750+02	4.730-01	-1.086+01	.8953	.8580
131	9.054+00	-3.071+00	9.546+00	5.195+02	4.696+02	4.652-01	-1.053+01	.8982	.8622
132	9.319+00	-3.104+00	9.813+00	5.120+02	4.646+02	4.582-01	-1.023+01	.9009	.8659
133	9.583+00	-3.135+00	1.008+01	5.051+02	4.600+02	4.519-01	-9.961+00	.9033	.8693
134	9.845+00	-3.163+00	1.034+01	4.989+02	4.559+02	4.461-01	-9.717+00	.9054	.8723
135	1.011+01	-3.189+00	1.060+01	4.934+02	4.522+02	4.409-01	-9.531+00	.9072	.8750
136	1.037+01	-3.213+00	1.087+01	4.884+02	4.489+02	4.363-01	-9.307+00	.9088	.8774
137	1.062+01	-3.233+00	1.112+01	4.838+02	4.461+02	4.321-01	-9.133+00	.9102	.8796
138	1.088+01	-3.253+00	1.138+01	4.800+02	4.437+02	4.285-01	-8.986+00	.9114	.8814
139	1.113+01	-3.264+00	1.164+01	4.767+02	4.418+02	4.255-01	-8.860+00	.9123	.8829
140	1.139+01	-3.275+00	1.189+01	4.741+02	4.404+02	4.230-01	-8.756+00	.9130	.8842
141	1.164+01	-3.282+00	1.214+01	4.721+02	4.394+02	4.212-01	-8.682+00	.9134	.8851
142	1.189+01	-3.285+00	1.239+01	4.701+02	4.389+02	4.194-01	-8.632+00	.9136	.8860
143	1.213+01	-3.287+00	1.263+01	4.724+02	4.388+02	4.215-01	-8.697+00	.9137	.8850
144	1.241+01	-3.287+00	1.291+01	4.814+02	4.388+02	4.293-01	-9.070+00	.9137	.8807
145	1.274+01	-3.287+00	1.324+01	4.873+02	4.388+02	4.352-01	-9.316+00	.9137	.8780
146	1.313+01	-3.287+00	1.363+01	4.924+02	4.388+02	4.400-01	-9.536+00	.9137	.8755
147	1.360+01	-3.287+00	1.410+01	4.973+02	4.388+02	4.446-01	-9.748+00	.9137	.8731

I	X	Y	S	VCOM	VBAR	MACH	CP	RB/RT	PS/PT
148	1.417+01	-3.287+00	1.467+01	5.024+02	4.388+02	4.493-01	-9.966+00	.9137	.8706
149	1.485+01	-3.287+00	1.535+01	5.084+02	4.388+02	4.549-01	-1.023+01	.9137	.8677
150	1.559+01	-3.287+00	1.609+01	5.055+02	4.388+02	4.522-01	-1.010+01	.9137	.8691
151	1.633+01	-3.287+00	1.684+01	5.035+02	4.388+02	4.503-01	-1.002+01	.9137	.8701
152	1.708+01	-3.287+00	1.758+01	5.015+02	4.388+02	4.485-01	-9.928+00	.9137	.8711
153	1.782+01	-3.287+00	1.832+01	4.994+02	4.388+02	4.465-01	-9.836+00	.9137	.8721
154	1.856+01	-3.287+00	1.906+01	4.973+02	4.388+02	4.445-01	-9.744+00	.9137	.8731
155	1.930+01	-3.287+00	1.980+01	4.953+02	4.388+02	4.424-01	-9.646+00	.9137	.8743
156	2.004+01	-3.287+00	2.055+01	4.927+02	4.388+02	4.402-01	-9.546+00	.9137	.8754
157	2.079+01	-3.287+00	2.129+01	4.902+02	4.388+02	4.380-01	-9.441+00	.9137	.8766
158	2.153+01	-3.287+00	2.203+01	4.877+02	4.388+02	4.356-01	-9.334+00	.9137	.8778
159	2.227+01	-3.287+00	2.277+01	4.850+02	4.388+02	4.332-01	-9.222+00	.9137	.8790
160	2.301+01	-3.287+00	2.351+01	4.824+02	4.388+02	4.307-01	-9.109+00	.9137	.8803
161	2.376+01	-3.287+00	2.426+01	4.795+02	4.388+02	4.281-01	-8.991+00	.9137	.8816
162	2.450+01	-3.287+00	2.500+01	4.767+02	4.388+02	4.254-01	-8.873+00	.9137	.8830
163	2.524+01	-3.287+00	2.574+01	4.737+02	4.388+02	4.227-01	-8.748+00	.9137	.8844
164	2.598+01	-3.287+00	2.648+01	4.706+02	4.388+02	4.198-01	-8.621+00	.9137	.8858
165	2.672+01	-3.287+00	2.723+01	4.674+02	4.388+02	4.169-01	-8.491+00	.9137	.8873
166	2.747+01	-3.287+00	2.797+01	4.641+02	4.388+02	4.138-01	-8.357+00	.9137	.8888
167	2.821+01	-3.287+00	2.871+01	4.607+02	4.388+02	4.107-01	-8.221+00	.9137	.8904
168	2.895+01	-3.287+00	2.945+01	4.572+02	4.388+02	4.075-01	-8.081+00	.9137	.8920
169	2.969+01	-3.287+00	3.019+01	4.536+02	4.388+02	4.041-01	-7.938+00	.9137	.8936
170	3.043+01	-3.287+00	3.094+01	4.499+02	4.388+02	4.008-01	-7.795+00	.9137	.8952
171	3.118+01	-3.287+00	3.168+01	4.463+02	4.388+02	3.974-01	-7.652+00	.9137	.8969
172	3.192+01	-3.287+00	3.242+01	4.426+02	4.388+02	3.943-01	-7.520+00	.9137	.8984
173	3.266+01	-3.287+00	3.316+01	4.399+02	4.388+02	3.916-01	-7.409+00	.9137	.8997
174	3.343+01	-3.287+00	3.393+01	4.386+02	4.388+02	3.903-01	-7.355+00	.9137	.9003
175	3.414+01	-3.287+00	3.465+01	4.407+02	4.388+02	3.923-01	-7.439+00	.9137	.8993
176	3.489+01	-3.287+00	3.539+01	4.532+02	4.388+02	4.038-01	-7.924+00	.9137	.8938
177	3.563+01	-3.287+00	3.613+01	5.158+02	4.388+02	4.618-01	-1.056+01	.9137	.8640

UPPER SHROUD
ON-BODY POINTS

I	X	Y	S	VCOM	VBAR	MACH	CP	RB/RT	PS/PT
178	3.563+01	3.287+00	3.613+01	-5.158+02	4.388+02	4.618-01	-1.056+01	.9137	.8640
179	3.489+01	3.287+00	3.539+01	-4.532+02	4.388+02	4.038-01	-7.924+00	.9137	.8938
180	3.414+01	3.287+00	3.465+01	-4.407+02	4.388+02	3.923-01	-7.439+00	.9137	.8993
181	3.340+01	3.287+00	3.390+01	-4.386+02	4.388+02	3.903-01	-7.355+00	.9137	.9003
182	3.266+01	3.287+00	3.316+01	-4.399+02	4.388+02	3.915-01	-7.409+00	.9137	.8997
183	3.192+01	3.287+00	3.242+01	-4.428+02	4.388+02	3.943-01	-7.520+00	.9137	.8984
184	3.118+01	3.287+00	3.168+01	-4.463+02	4.388+02	3.974-01	-7.652+00	.9137	.8969
185	3.043+01	3.287+00	3.094+01	-4.499+02	4.388+02	4.008-01	-7.795+00	.9137	.8952
186	2.969+01	3.287+00	3.019+01	-4.536+02	4.388+02	4.041-01	-7.938+00	.9137	.8936
187	2.895+01	3.287+00	2.945+01	-4.572+02	4.388+02	4.075-01	-8.081+00	.9137	.8920
188	2.821+01	3.287+00	2.871+01	-4.607+02	4.388+02	4.107-01	-8.221+00	.9137	.8904
189	2.747+01	3.287+00	2.797+01	-4.641+02	4.388+02	4.138-01	-8.357+00	.9137	.8888
190	2.672+01	3.287+00	2.723+01	-4.674+02	4.388+02	4.169-01	-8.491+00	.9137	.8873
191	2.598+01	3.287+00	2.648+01	-4.706+02	4.388+02	4.198-01	-8.621+00	.9137	.8858
192	2.524+01	3.287+00	2.574+01	-4.737+02	4.388+02	4.227-01	-8.748+00	.9137	.8844
193	2.450+01	3.287+00	2.500+01	-4.767+02	4.388+02	4.254-01	-8.873+00	.9137	.8830
194	2.376+01	3.287+00	2.426+01	-4.795+02	4.388+02	4.281-01	-8.991+00	.9137	.8816
195	2.301+01	3.287+00	2.351+01	-4.824+02	4.388+02	4.307-01	-9.109+00	.9137	.8803
196	2.227+01	3.287+00	2.277+01	-4.850+02	4.388+02	4.332-01	-9.222+00	.9137	.8790
197	2.153+01	3.287+00	2.203+01	-4.877+02	4.388+02	4.356-01	-9.334+00	.9137	.8778
198	2.079+01	3.287+00	2.129+01	-4.902+02	4.388+02	4.380-01	-9.441+00	.9137	.8766
199	2.004+01	3.287+00	2.055+01	-4.927+02	4.388+02	4.402-01	-9.546+00	.9137	.8754
200	1.930+01	3.287+00	1.980+01	-4.950+02	4.388+02	4.424-01	-9.646+00	.9137	.8743
201	1.856+01	3.287+00	1.906+01	-4.973+02	4.388+02	4.445-01	-9.744+00	.9137	.8731
202	1.782+01	3.287+00	1.832+01	-4.994+02	4.388+02	4.465-01	-9.836+00	.9137	.8721
203	1.708+01	3.287+00	1.758+01	-5.015+02	4.388+02	4.485-01	-9.928+00	.9137	.8711
204	1.633+01	3.287+00	1.684+01	-5.035+02	4.388+02	4.503-01	-1.002+01	.9137	.8701
205	1.559+01	3.287+00	1.609+01	-5.055+02	4.388+02	4.522-01	-1.010+01	.9137	.8691
206	1.485+01	3.287+00	1.535+01	-5.084+02	4.388+02	4.549-01	-1.023+01	.9137	.8677
207	1.417+01	3.287+00	1.467+01	-5.024+02	4.388+02	4.493-01	-9.966+00	.9137	.8707
208	1.360+01	3.287+00	1.410+01	-4.973+02	4.388+02	4.446-01	-9.748+00	.9137	.8731
209	1.313+01	3.287+00	1.363+01	-4.924+02	4.388+02	4.400-01	-9.536+00	.9137	.8755
210	1.274+01	3.287+00	1.324+01	-4.873+02	4.388+02	4.352-01	-9.316+00	.9137	.8780
211	1.241+01	3.287+00	1.291+01	-4.814+02	4.388+02	4.298-01	-9.070+00	.9137	.8807
212	1.213+01	3.287+00	1.263+01	-4.724+02	4.388+02	4.215-01	-8.697+00	.9137	.8850
213	1.189+01	3.286+00	1.239+01	-4.701+02	4.389+02	4.194-01	-8.602+00	.9136	.8860
214	1.164+01	3.282+00	1.214+01	-4.721+02	4.394+02	4.212-01	-8.682+00	.9134	.8851
215	1.139+01	3.275+00	1.189+01	-4.741+02	4.404+02	4.230-01	-8.756+00	.9130	.8842
216	1.113+01	3.264+00	1.164+01	-4.767+02	4.418+02	4.255-01	-8.860+00	.9123	.8829
217	1.088+01	3.250+00	1.138+01	-4.800+02	4.437+02	4.285-01	-8.986+00	.9114	.8814
218	1.062+01	3.233+00	1.112+01	-4.838+02	4.461+02	4.321-01	-9.133+00	.9102	.8796
219	1.037+01	3.213+00	1.087+01	-4.883+02	4.489+02	4.363-01	-9.307+00	.9088	.8774
220	1.011+01	3.189+00	1.060+01	-4.934+02	4.522+02	4.409-01	-9.501+00	.9072	.8750
221	9.845+00	3.163+00	1.034+01	-4.989+02	4.559+02	4.461-01	-9.717+00	.9054	.8723
222	9.583+00	3.135+00	1.008+01	-5.051+02	4.600+02	4.519-01	-9.961+00	.9033	.8693
223	9.319+00	3.104+00	9.813+00	-5.120+02	4.646+02	4.582-01	-1.023+01	.9009	.8659
224	9.054+00	3.071+00	9.546+00	-5.195+02	4.696+02	4.652-01	-1.053+01	.8982	.8622
225	8.788+00	3.035+00	9.277+00	-5.277+02	4.750+02	4.730-01	-1.086+01	.8953	.8580
226	8.521+00	3.001+00	9.006+00	-5.367+02	4.807+02	4.814-01	-1.122+01	.8921	.8534

I	X	Y	S	VCOM	VBAR	MACH	CP	RB/RT	PS/PT
227	8.253+00	2.962+00	8.737+00	-5.464+02	4.869+02	4.905-01	-1.162+01	.8885	.8483
228	7.984+00	2.923+00	8.466+00	-5.569+02	4.934+02	5.004-01	-1.205+01	.8847	.8428
229	7.715+00	2.883+00	8.193+00	-5.682+02	5.003+02	5.110-01	-1.252+01	.8805	.8368
230	7.445+00	2.842+00	7.921+00	-5.803+02	5.074+02	5.225-01	-1.303+01	.8760	.8302
231	7.175+00	2.801+00	7.647+00	-5.931+02	5.149+02	5.347-01	-1.358+01	.8711	.8231
232	6.905+00	2.760+00	7.374+00	-6.068+02	5.225+02	5.478-01	-1.417+01	.8658	.8155
233	6.635+00	2.719+00	7.101+00	-6.213+02	5.304+02	5.617-01	-1.480+01	.8602	.8072
234	6.366+00	2.679+00	6.829+00	-6.366+02	5.385+02	5.764-01	-1.546+01	.8542	.7984
235	6.097+00	2.639+00	6.557+00	-6.526+02	5.466+02	5.919-01	-1.618+01	.8478	.7890
236	5.830+00	2.600+00	6.287+00	-6.693+02	5.548+02	6.082-01	-1.692+01	.8411	.7790
237	5.562+00	2.562+00	6.017+00	-6.867+02	5.629+02	6.252-01	-1.771+01	.8340	.7684
238	5.296+00	2.525+00	5.749+00	-7.048+02	5.710+02	6.430-01	-1.853+01	.8265	.7572
239	5.032+00	2.491+00	5.481+00	-7.235+02	5.789+02	6.615-01	-1.939+01	.8188	.7455
240	4.768+00	2.459+00	5.216+00	-7.427+02	5.866+02	6.807-01	-2.027+01	.8108	.7333
241	4.506+00	2.428+00	4.952+00	-7.623+02	5.940+02	7.004-01	-2.119+01	.8026	.7207
242	4.245+00	2.400+00	4.689+00	-7.822+02	6.009+02	7.205-01	-2.212+01	.7943	.7077
243	3.985+00	2.374+00	4.429+00	-8.023+02	6.074+02	7.411-01	-2.307+01	.7860	.6944
244	3.728+00	2.351+00	4.170+00	-8.225+02	6.134+02	7.619-01	-2.404+01	.7779	.6808
245	3.471+00	2.331+00	3.913+00	-8.427+02	6.187+02	7.828-01	-2.502+01	.7701	.6672
246	3.217+00	2.314+00	3.658+00	-8.627+02	6.232+02	8.038-01	-2.602+01	.7629	.6535
247	2.965+00	2.300+00	3.405+00	-8.828+02	6.270+02	8.250-01	-2.705+01	.7565	.6397
248	2.714+00	2.290+00	3.154+00	-9.033+02	6.299+02	8.469-01	-2.817+01	.7514	.6255
249	2.466+00	2.283+00	2.906+00	-9.256+02	6.319+02	8.739-01	-2.948+01	.7477	.6100
250	2.219+00	2.279+00	2.659+00	-9.550+02	6.329+02	9.031-01	-3.136+01	.7457	.5893
251	1.979+00	2.281+00	2.419+00	-9.938+02	6.322+02	9.428-01	-3.389+01	.7470	.5640
252	1.754+00	2.293+00	2.194+00	-1.012+03	6.288+02	9.664-01	-3.569+01	.7532	.5492
253	1.548+00	2.315+00	1.986+00	-1.011+03	6.226+02	9.650-01	-3.610+01	.7636	.5500
254	1.358+00	2.345+00	1.794+00	-1.000+03	6.147+02	9.535-01	-3.595+01	.7760	.5572
255	1.184+00	2.384+00	1.616+00	-9.865+02	6.051+02	9.379-01	-3.553+01	.7891	.5671
256	1.025+00	2.425+00	1.451+00	-9 715+02	5.944+02	9.213-01	-3.502+01	.8021	.5777
257	8.796-01	2.474+00	1.299+00	-9.569+02	5.831+02	9.052-01	-3.449+01	.8145	.5880
258	7.478-01	2.525+00	1.157+00	-9.433+02	5.713+02	8.902-01	-3.398+01	.8263	.5976
259	6.286-01	2.579+00	1.026+00	-9.307+02	5.593+02	8.765-01	-3.351+01	.8372	.6064
260	5.217-01	2.635+00	9.055-01	-9.192+02	5.473+02	8.640-01	-3.306+01	.8472	.6144
261	4.263-01	2.694+00	7.937-01	-9.084+02	5.354+02	8.524-01	-3.263+01	.8565	.6220
262	3.421-01	2.753+00	6.905-01	-8.977+02	5.238+02	8.409-01	-3.216+01	.8649	.6294
263	2.687-01	2.814+00	5.954-01	-8.865+02	5.126+02	8.290-01	-3.163+01	.8726	.6371
264	2.044-01	2.875+00	5.060-01	-8.731+02	5.015+02	8.147-01	-3.090+01	.8797	.6464
265	1.489-01	2.940+00	4.215-01	-8.574+02	4.905+02	7.982-01	-3.000+01	.8864	.6572
266	1.030-01	3.003+00	3.431-01	-8.383+02	4.802+02	7.783-01	-2.884+01	.8924	.6702
267	6.650-02	3.065+00	2.703-01	-8.155+02	4.704+02	7.547-01	-2.741+01	.8978	.6855
268	3.746-02	3.132+00	1.984-01	-7.845+02	4.605+02	7.228-01	-2.544+01	.9030	.7062
269	1.544-02	3.205+00	1.220-01	-7.455+02	4.500+02	6.835-01	-2.332+01	.9083	.7315
270	3.235-03	3.285+00	4.130-02	-7.141+02	4.391+02	6.522-01	-2.116+01	.9136	.7514
271	8.150-03	3.368+00	-4.297-02	-6.583+02	4.275+02	5.974-01	-1.794+01	.9188	.7856
272	4.012-02	3.445+00	-1.266-01	-5.081+02	4.139+02	4.546-01	-1.036+01	.9248	.8678
273	1.025-01	3.513+00	-2.182-01	-3.398+02	3.985+02	3.006-01	-4.108+00	.9311	.9392
274	1.871-01	3.571+00	-3.212-01	-2.242+02	3.825+02	1.973-01	-1.233+00	.9372	.9732
275	2.853-01	3.621+00	-4.313-01	-1.499+02	3.669+02	1.317-01	-7.454-04	.9428	.9880

ORIGINAL PAGE IS
OF POOR QUALITY

I	X	Y	S	VCOM	VBAR	MACH	CP	RB/RT	PS/PT
276	3.935-01	3.665+00	-5.479-01	-9.957+01	3.518+07	8.736-02	5.607-01	.9479	.9947
277	5.095-01	3.703+00	-6.701-01	-6.352+01	3.373+02	5.571-02	8.250-01	.9525	.9978
278	6.330-01	3.738+00	-7.984-01	-3.621+01	3.233+02	3.175-02	9.482-01	.9567	.9993
279	7.640-01	3.770+00	-9.332-01	-1.477+01	3.096+02	1.295-02	9.980-01	.9605	.9999
280	9.028-01	3.799+00	-1.075+00	2.654+00	2.963+02	2.327-03	1.008+00	.9641	1.0000
281	1.049+00	3.825+00	-1.224+00	1.714+01	2.833+02	1.503-02	9.944-01	.9674	.9998
282	1.204+00	3.850+00	-1.381+00	2.945+01	2.705+02	2.582-02	9.679-01	.9704	.9995
283	1.368+00	3.873+00	-1.546+00	4.003+01	2.581+02	3.510-02	9.337-01	.9732	.9991
284	1.541+00	3.894+00	-1.720+00	4.922+01	2.460+02	4.316-02	8.955-01	.9758	.9987
285	1.723+00	3.912+00	-1.903+00	5.723+01	2.341+02	5.019-02	8.555-01	.9781	.9982
286	1.914+00	3.929+00	-2.096+00	6.428+01	2.225+02	5.638-02	8.151-01	.9803	.9978
287	2.117+00	3.942+00	-2.298+00	7.046+01	2.113+02	6.181-02	7.758-01	.9823	.9973
288	2.330+00	3.952+00	-2.511+00	7.587+01	2.004+02	6.655-02	7.384-01	.9841	.9969
289	2.554+00	3.958+00	-2.735+00	8.077+01	1.898+02	7.085-02	7.019-01	.9858	.9965
290	2.820+00	3.960+00	-3.002+00	8.433+01	1.784+02	7.398-02	6.737-01	.9875	.9962
291	3.121+00	3.960+00	-3.303+00	8.648+01	1.667+02	7.587-02	6.558-01	.9891	.9960
292	3.422+00	3.960+00	-3.604+00	8.900+01	1.560+02	7.808-02	6.346-01	.9905	.9957
293	3.724+00	3.960+00	-3.905+00	9.127+01	1.463+02	8.008-02	6.148-01	.9917	.9955
294	4.025+00	3.960+00	-4.207+00	9.330+01	1.443+02	8.186-02	5.970-01	.9919	.9953
295	4.326+00	3.960+00	-4.508+00	9.508+01	1.443+02	8.342-02	5.812-01	.9919	.9951
296	4.627+00	3.960+00	-4.809+00	9.663+01	1.443+02	8.479-02	5.672-01	.9919	.9950
297	4.929+00	3.960+00	-5.111+00	9.799+01	1.443+02	8.598-02	5.547-01	.9919	.9948
298	5.230+00	3.960+00	-5.412+00	9.913+01	1.443+02	8.698-02	5.441-01	.9919	.9947
299	5.531+00	3.960+00	-5.713+00	1.001+02	1.443+02	8.784-02	5.348-01	.9919	.9946
300	5.833+00	3.960+00	-6.014+00	1.009+02	1.443+02	8.858-02	5.269-01	.9919	.9945
301	6.134+00	3.960+00	-6.316+00	1.016+02	1.443+02	8.916-02	5.205-01	.9919	.9945
302	6.435+00	3.960+00	-6.617+00	1.021+02	1.443+02	8.963-02	5.155-01	.9919	.9944
303	6.736+00	3.960+00	-6.918+00	1.025+02	1.443+02	8.997-02	5.117-01	.9919	.9944
304	7.038+00	3.960+00	-7.220+00	1.028+02	1.443+02	9.017-02	5.095-01	.9919	.9943
305	7.339+00	3.960+00	-7.521+00	1.029+02	1.443+02	9.032-02	5.079-01	.9919	.9943
306	7.640+00	3.960+00	-7.822+00	1.029+02	1.443+02	9.029-02	5.082-01	.9919	.9943
307	7.942+00	3.960+00	-8.123+00	1.028+02	1.443+02	9.021-02	5.091-01	.9919	.9943
308	8.243+00	3.960+00	-8.425+00	1.025+02	1.443+02	8.998-02	5.116-01	.9919	.9944
309	8.544+00	3.961+00	-8.726+00	1.022+02	1.443+02	8.971-02	5.146-01	.9919	.9944
310	8.845+00	3.960+00	-9.027+00	1.019+02	1.443+02	8.934-02	5.186-01	.9919	.9944
311	9.147+00	3.960+00	-9.329+00	1.013+02	1.443+02	8.889-02	5.236-01	.9919	.9945
312	9.448+00	3.960+00	-9.630+00	1.008+02	1.443+02	8.847-02	5.281-01	.9919	.9945
313	9.749+00	3.960+00	-9.931+00	1.003+02	1.443+02	8.801-02	5.331-01	.9919	.9946
314	1.005+01	3.960+00	-1.023+01	9.990+01	1.443+02	8.766-02	5.368-01	.9919	.9946
315	1.035+01	3.960+00	-1.053+01	9.966+01	1.443+02	8.745-02	5.390-01	.9919	.9947
316	1.065+01	3.960+00	-1.084+01	9.963+01	1.443+02	8.740-02	5.396-01	.9919	.9947
317	1.095+01	3.960+00	-1.114+01	9.995+01	1.443+02	8.771-02	5.363-01	.9919	.9946
318	1.126+01	3.960+00	-1.144+01	1.006+02	1.443+02	8.830-02	5.300-01	.9919	.9946
319	1.156+01	3.960+00	-1.174+01	1.018+02	1.443+02	8.934-02	5.186-01	.9919	.9944
320	1.186+01	3.960+00	-1.204+01	1.034+02	1.443+02	9.074-02	5.032-01	.9919	.9943
321	1.216+01	3.960+00	-1.234+01	1.056+02	1.443+02	9.265-02	4.818-01	.9919	.9940
322	1.249+01	3.960+00	-1.267+01	1.033+02	1.443+02	9.061-02	5.047-01	.9919	.9943
323	1.288+01	3.960+00	-1.307+01	1.009+02	1.443+02	8.855-02	5.272-01	.9919	.9945
324	1.336+01	3.960+00	-1.354+01	9.826+01	1.443+02	8.622-02	5.521-01	.9919	.9948

I	X	Y	S	VCOM	VBAR	MACH	CP	RB/RT	PS/PT
325	1.393+01	3.960+00	-1.411+01	9.509+01	1.443+02	8.343-02	5.811-01	.9919	.9951
326	1.461+01	3.960+00	-1.480+01	9.076+01	1.443+02	7.963-02	6.191-01	.9919	.9956
327	1.536+01	3.960+00	-1.555+01	9.332+01	1.443+02	8.189-02	5.968-01	.9919	.9953
328	1.611+01	3.960+00	-1.630+01	9.523+01	1.443+02	8.355-02	5.799-01	.9919	.9951
329	1.686+01	3.960+00	-1.705+01	9.689+01	1.443+02	8.501-02	5.648-01	.9919	.9950
330	1.761+01	3.960+00	-1.780+01	9.855+01	1.443+02	8.647-02	5.495-01	.9919	.9948
331	1.836+01	3.960+00	-1.855+01	1.001+02	1.443+02	8.788-02	5.345-01	.9919	.9946
332	1.912+01	3.960+00	-1.930+01	1.018+02	1.443+02	8.929-02	5.192-01	.9919	.9944
333	1.987+01	3.960+00	-2.005+01	1.033+02	1.443+02	9.057-02	5.039-01	.9919	.9943
334	2.062+01	3.960+00	-2.080+01	1.049+02	1.443+02	9.203-02	4.887-01	.9919	.9941
335	2.137+01	3.960+00	-2.155+01	1.064+02	1.443+02	9.339-02	4.733-01	.9919	.9939
336	2.212+01	3.960+00	-2.230+01	1.080+02	1.443+02	9.475-02	4.576-01	.9919	.9937
337	2.287+01	3.960+00	-2.305+01	1.095+02	1.443+02	9.605-02	4.423-01	.9919	.9936
338	2.362+01	3.960+00	-2.380+01	1.109+02	1.443+02	9.735-02	4.271-01	.9919	.9934
339	2.437+01	3.960+00	-2.455+01	1.124+02	1.443+02	9.862-02	4.119-01	.9919	.9932
340	2.512+01	3.960+00	-2.530+01	1.137+02	1.443+02	9.982-02	3.973-01	.9919	.9931
341	2.587+01	3.960+00	-2.605+01	1.150+02	1.443+02	1.009-01	3.836-01	.9919	.9929
342	2.662+01	3.960+00	-2.680+01	1.162+02	1.443+02	1.020-01	3.715-01	.9919	.9928
343	2.737+01	3.960+00	-2.755+01	1.172+02	1.443+02	1.029-01	3.592-01	.9919	.9926
344	2.812+01	3.960+00	-2.830+01	1.181+02	1.443+02	1.037-01	3.497-01	.9919	.9925
345	2.887+01	3.960+00	-2.905+01	1.187+02	1.443+02	1.042-01	3.428-01	.9919	.9924
346	2.962+01	3.960+00	-2.980+01	1.190+02	1.443+02	1.044-01	3.398-01	.9919	.9924
347	3.037+01	3.960+00	-3.055+01	1.188+02	1.443+02	1.043-01	3.419-01	.9919	.9924
348	3.112+01	3.960+00	-3.130+01	1.179+02	1.443+02	1.035-01	3.513-01	.9919	.9925
349	3.187+01	3.960+00	-3.205+01	1.162+02	1.443+02	1.019-01	3.711-01	.9919	.9928
350	3.262+01	3.960+00	-3.280+01	1.129+02	1.443+02	9.910-02	4.061-01	.9919	.9932
351	3.337+01	3.960+00	-3.356+01	1.073+02	1.443+02	9.415-02	4.645-01	.9919	.9938
352	3.412+01	3.960+00	-3.431+01	9.723+01	1.443+02	8.531-02	5.617-01	.9919	.9949
353	3.487+01	3.960+00	-3.506+01	7.701+01	1.443+02	6.755-02	7.280-01	.9919	.9968
354	3.562+01	3.960+00	-3.581+01	1.314+01	1.443+02	1.152-02	9.998-01	.9919	.9999

RAKE NUMBER 1

I	X	Y	VX	VY	VRE	THETA	VBL	MACH	RB/RT	PS/PT	WFRACT
1	-1.000+00	-5.000+00	1.152+02	1.060+02	1.566+02	4.263+01	4.391+02	1.375-01	.9136	.9869	0.000
2	-1.000+00	-4.474+00	1.176+02	1.345+02	1.786+02	4.893+01	4.391+02	1.570-01	.9136	.9829	2.153-02
3	-1.000+00	-3.947+00	1.336+02	1.759+02	2.209+02	5.279+01	4.391+02	1.944-01	.9136	.9740	4.476-02
4	-1.000+00	-3.421+00	1.815+02	2.213+02	2.862+02	5.065+01	4.391+02	2.525-01	.9136	.9566	7.389-02
5	-1.000+00	-2.895+00	2.600+02	2.364+02	3.514+02	4.227+01	4.391+02	3.111-01	.9136	.9351	1.147-01
6	-1.000+00	-2.368+00	3.317+02	2.091+02	3.921+02	3.223+01	4.391+02	3.479-01	.9136	.9197	1.694-01
7	-1.000+00	-1.842+00	3.778+02	1.625+02	4.113+02	2.328+01	4.391+02	3.654-01	.9136	.9119	2.351-01
8	-1.000+00	-1.316+00	4.037+02	1.133+02	4.193+02	1.568+01	4.391+02	3.727-01	.9136	.9085	3.073-01
9	-1.000+00	-7.895-01	4.171+02	6.642+01	4.223+02	9.048+00	4.391+02	3.755-01	.9136	.9073	3.832-01
10	-1.000+00	-2.632-01	4.228+02	2.185+01	4.233+02	2.958+00	4.391+02	3.764-01	.9136	.9068	4.609-01
11	-1.000+00	2.632-01	4.228+02	-2.185+01	4.233+02	-2.958+00	4.391+02	3.764-01	.9136	.9068	5.391-01
12	-1.000+00	7.895-01	4.171+02	-6.642+01	4.223+02	-9.048+00	4.391+02	3.755-01	.9136	.9073	6.168-01
13	-1.000+00	1.316+00	4.037+02	-1.133+02	4.193+02	-1.568+01	4.391+02	3.727-01	.9136	.9085	6.927-01
14	-1.000+00	1.842+00	3.778+02	-1.625+02	4.113+02	-2.328+01	4.391+02	3.654-01	.9136	.9119	7.649-01
15	-1.000+00	2.368+00	3.317+02	-2.091+02	3.921+02	-3.223+01	4.391+02	3.479-01	.9136	.9197	8.306-01
16	-1.000+00	2.895+00	2.600+02	-2.364+02	3.514+02	-4.227+01	4.391+02	3.111-01	.9136	.9351	8.853-01
17	-1.000+00	3.421+00	1.815+02	-2.213+02	2.862+02	-5.065+01	4.391+02	2.525-01	.9136	.9566	9.261-01
18	-1.000+00	3.947+00	1.336+02	-1.759+02	2.209+02	-5.279+01	4.391+02	1.944-01	.9136	.9740	9.552-01
19	-1.000+00	4.474+00	1.176+02	-1.345+02	1.786+02	-4.893+01	4.391+02	1.570-01	.9136	.9829	9.785-01
20	-1.000+00	5.000+00	1.152+02	-1.060+02	1.566+02	-4.263+01	4.391+02	1.375-01	.9136	.9869	1.000+00

RAKE NUMBER 2

I	X	Y	VX	VY	VRE	THETA	VBL	MACH	RB/RT	PS/PT	WFRACT
1	-5.000-01	-5.000+00	9.258+01	1.002+02	1.365+02	4.727+01	4.391+02	1.198-01	.9136	.9900	0.000
2	-5.000-01	-4.474+00	8.054+01	1.315+02	1.542+02	5.852+01	4.391+02	1.355-01	.9136	.9873	1.523-02
3	-5.000-01	-3.947+00	7.239+01	1.937+02	2.068+02	6.951+01	4.391+02	1.819-01	.9136	.9772	2.868-02
4	-5.000-01	-3.421+00	1.253+02	3.075+02	3.321+02	6.793+01	4.391+02	2.937-01	.9136	.9419	4.607-02
5	-5.000-01	-2.895+00	2.856+02	3.445+02	4.475+02	5.034+01	4.391+02	3.985-01	.9136	.8963	8.221-02
6	-5.000-01	-2.368+00	3.940+02	2.743+02	4.801+02	3.484+01	4.391+02	4.286-01	.9136	.8814	1.420-01
7	-5.000-01	-1.842+00	4.405+02	1.957+02	4.820+02	2.396+01	4.391+02	4.304-01	.9136	.8805	2.154-01
8	-5.000-01	-1.316+00	4.597+02	1.297+02	4.776+02	1.575+01	4.391+02	4.263-01	.9136	.8825	2.946-01
9	-5.000-01	-7.895-01	4.676+02	7.390+01	4.734+02	8.981+00	4.391+02	4.224-01	.9136	.8845	3.761-01
10	-5.000-01	-2.632-01	4.704+02	2.401+01	4.711+02	2.922+00	4.391+02	4.202-01	.9136	.8856	4.586-01
11	-5.000-01	2.632-01	4.704+02	-2.401+01	4.711+02	-2.922+00	4.391+02	4.202-01	.9136	.8856	5.414-01
12	-5.000-01	7.895-01	4.676+02	-7.390+01	4.734+02	-8.981+00	4.391+02	4.224-01	.9136	.8845	6.239-01
13	-5.000-01	1.316+00	4.597+02	-1.297+02	4.776+02	-1.575+01	4.391+02	4.263-01	.9136	.8825	7.054-01
14	-5.000-01	1.842+00	4.405+02	-1.957+02	4.820+02	-2.396+01	4.391+02	4.304-01	.9136	.8805	7.846-01
15	-5.000-01	2.368+00	3.940+02	-2.743+02	4.801+02	-3.484+01	4.391+02	4.286-01	.9136	.8814	8.580-01
16	-5.000-01	2.895+00	2.856+02	-3.445+02	4.475+02	-5.034+01	4.391+02	3.985-01	.9136	.8963	9.178-01
17	-5.000-01	3.421+00	1.253+02	-3.075+02	3.321+02	-6.793+01	4.391+02	2.937-01	.9136	.9419	9.539-01
18	-5.000-01	3.947+00	7.239+01	-1.937+02	2.068+02	-6.951+01	4.391+02	1.819-01	.9136	.9772	9.713-01
19	-5.000-01	4.474+00	8.054+01	-1.315+02	1.542+02	-5.852+01	4.391+02	1.355-01	.9136	.9873	9.848-01
20	-5.000-01	5.000+00	9.258+01	-1.002+02	1.365+02	-4.727+01	4.391+02	1.198-01	.9136	.9900	1.000+00

RAKE NUMBER 3

I	X	Y	VX	VY	VRE	THETA	V3L	MACH	RB/RT	PS/PT	WFRACT
	1.000+00	-2.434+00	9.214+02	3.002+02	9.691+02	1.804+01	5.926+02	9.186-01	.8041	.5794	0.000
1	1.000+00	-2.200+00	8.623+02	2.386+02	8.947+02	1.547+01	5.926+02	8.377-01	.8042	.6315	5.773-02
2	1.000+00	-1.968+00	8.101+02	1.993+02	8.342+02	1.382+01	5.926+02	7.740-01	.8042	.6729	1.113-01
3	1.000+00	-1.737+00	7.710+02	1.657+02	7.886+02	1.213+01	5.926+02	7.271-01	.8042	.7034	1.620-01
4	1.000+00	-1.505+00	7.416+02	1.366+02	7.541+02	1.044+01	5.926+02	6.921-01	.8042	.7260	2.105-01
5	1.000+00	-1.274+00	7.194+02	1.110+02	7.279+02	8.772+00	5.926+02	6.659-01	.8042	.7427	2.574-01
6	1.000+00	-1.042+00	7.027+02	8.792+01	7.082+02	7.131+00	5.926+02	6.464-01	.8042	.7551	3.030-01
7	1.000+00	-8.105-01	6.904+02	6.668+01	6.936+02	5.516+00	5.926+02	6.320-01	.8042	.7641	3.476-01
8	1.000+00	-5.790-01	6.818+02	4.676+01	6.834+02	3.923+00	5.926+02	6.219-01	.8042	.7704	3.916-01
9	1.000+00	-3.474-01	6.762+02	2.772+01	6.768+02	2.347+00	5.926+02	6.155-01	.8042	.7744	4.351-01
10	1.000+00	-1.158-01	6.735+02	9.184+00	6.736+02	7.812-01	5.926+02	6.124-01	.8042	.7764	4.784-01
11	1.000+00	1.158-01	6.735+02	-9.184+00	6.736+02	-7.812-01	5.926+02	6.124-01	.8042	.7764	5.216-01
12	1.000+00	3.474-01	6.762+02	-2.772+01	6.768+02	-2.347+00	5.926+02	6.155-01	.8042	.7744	5.649-01
13	1.000+00	5.790-01	6.818+02	-4.676+01	6.834+02	-3.923+00	5.926+02	6.219-01	.8042	.7704	6.084-01
14	1.000+00	8.105-01	6.904+02	-6.668+01	6.936+02	-5.516+00	5.926+02	6.320-01	.8042	.7641	6.524-01
15	1.000+00	1.042+00	7.027+02	-8.792+01	7.082+02	-7.131+00	5.926+02	6.464-01	.8042	.7551	6.970-01
16	1.000+00	1.274+00	7.194+02	-1.110+02	7.279+02	-8.772+00	5.926+02	6.659-01	.8042	.7427	7.426-01
17	1.000+00	1.505+00	7.416+02	-1.366+02	7.541+02	-1.044+01	5.926+02	6.921-01	.8042	.7260	7.895-01
18	1.000+00	1.737+00	7.710+02	-1.657+02	7.886+02	-1.213+01	5.926+02	7.271-01	.8042	.7034	8.380-01
19	1.000+00	1.968+00	8.101+02	-1.993+02	8.342+02	-1.382+01	5.926+02	7.740-01	.8042	.6729	8.887-01
20	1.000+00	2.200+00	8.623+02	-2.386+02	8.947+02	-1.547+01	5.926+02	8.377-01	.8042	.6315	9.423-01
	1.000+00	2.434+00	9.214+02	-3.002+02	9.691+02	-1.804+01	5.926+02	9.186-01	.8041	.5794	1.000+00

RAKE NUMBER 4

I	X	Y	VX	VY	VRE	THETA	V3L	MACH	RB/RT	PS/PT	WFRACT
	2.096+00	-2.279+00	9.724+02	9.634+00	9.725+02	5.676-01	6.327+02	9.224-01	.7460	.5770	0.000
1	2.096+00	-2.100+00	9.482+02	2.434+01	9.486+02	1.470+00	6.327+02	8.963-01	.7460	.5938	4.448-02
2	2.096+00	-1.879+00	9.129+02	3.475+01	9.135+02	2.180+00	6.327+02	8.579-01	.7460	.6184	9.758-02
3	2.096+00	-1.658+00	8.830+02	3.822+01	8.839+02	2.478+00	6.327+02	8.262-01	.7460	.6390	1.488-01
4	2.096+00	-1.437+00	8.582+02	3.763+01	8.590+02	2.510+00	6.327+02	7.999-01	.7460	.6561	1.985-01
5	2.096+00	-1.216+00	8.379+02	3.452+01	8.386+02	2.359+00	6.327+02	7.786-01	.7460	.6700	2.469-01
6	2.096+00	-9.947-01	8.217+02	2.979+01	8.222+02	2.076+00	6.327+02	7.616-01	.7460	.6810	2.943-01
7	2.096+00	-7.737-01	8.092+02	2.400+01	8.095+02	1.699+00	6.327+02	7.485-01	.7460	.6896	3.408-01
8	2.096+00	-5.526-01	8.000+02	1.754+01	8.002+02	1.256+00	6.327+02	7.389-01	.7460	.6958	3.867-01
9	2.096+00	-3.316-01	7.941+02	1.067+01	7.941+02	7.698-01	6.327+02	7.327-01	.7460	.6998	4.322-01
10	2.096+00	-1.105-01	7.911+02	3.584+00	7.911+02	2.596-01	6.327+02	7.297-01	.7460	.7018	4.774-01
11	2.096+00	1.105-01	7.911+02	-3.584+00	7.911+02	-2.596-01	6.327+02	7.297-01	.7460	.7018	5.226-01
12	2.096+00	3.316-01	7.941+02	-1.067+01	7.941+02	-7.698-01	6.327+02	7.327-01	.7460	.6998	5.678-01
13	2.096+00	5.526-01	8.000+02	-1.754+01	8.002+02	-1.256+00	6.327+02	7.389-01	.7460	.6958	6.133-01
14	2.096+00	7.737-01	8.092+02	-2.400+01	8.095+02	-1.699+00	6.327+02	7.485-01	.7460	.6896	6.592-01
15	2.096+00	9.947-01	8.217+02	-2.979+01	8.222+02	-2.076+00	6.327+02	7.615-01	.7460	.6810	7.057-01
16	2.096+00	1.216+00	8.379+02	-3.452+01	8.386+02	-2.359+00	6.327+02	7.786-01	.7460	.6700	7.531-01
17	2.096+00	1.437+00	8.582+02	-3.763+01	8.593+02	-2.510+00	6.327+02	7.999-01	.7460	.6561	8.015-01
18	2.096+00	1.658+00	8.830+02	-3.822+01	8.839+02	-2.478+00	6.327+02	8.262-01	.7460	.6390	8.512-01

I	X	Y	VX	VY	VRE	THETA	VBL	MACH	RB/RT	PS/PT	WFRACT
19	2.096+00	1.879+00	9.129+02	-3.475+01	9.135+02	-2.180+00	6.327+02	8.579-01	.7460	.6184	9.024-01
20	2.096+00	2.100+00	9.462+02	-2.434+01	9.486+02	-1.470+00	6.327+02	8.960-01	.7460	.5938	9.555-01
	2.096+00	2.279+00	9.724+02	-9.634+00	9.725+02	-5.676-01	6.327+02	9.224-01	.7460	.5770	1.000+00

RAKE NUMBER 5

I	X	Y	VX	VY	VRE	THETA	VBL	MACH	RB/RT	PS/PT	WFRACT
	4.096+00	-2.385+00	7.898+02	-7.814+01	7.937+02	-5.650+00	6.047+02	7.323-01	.7895	.7001	0.000
1	4.096+00	-2.100+00	7.824+02	-6.492+01	7.851+02	-4.743+00	6.047+02	7.235-01	.7895	.7058	6.132-02
2	4.096+00	-1.879+00	7.772+02	-5.562+01	7.792+02	-4.094+00	6.047+02	7.175-01	.7895	.7096	1.085-01
3	4.096+00	-1.658+00	7.723+02	-4.707+01	7.737+02	-3.488+00	6.047+02	7.119-01	.7895	.7132	1.554-01
4	4.096+00	-1.437+00	7.678+02	-3.921+01	7.688+02	-2.924+00	6.047+02	7.069-01	.7895	.7165	2.020-01
5	4.096+00	-1.216+00	7.637+02	-3.200+01	7.644+02	-2.399+00	6.047+02	7.025-01	.7895	.7193	2.483-01
6	4.096+00	-9.947-01	7.601+02	-2.536+01	7.606+02	-1.911+00	6.047+02	6.986-01	.7895	.7218	2.944-01
7	4.096+00	-7.737-01	7.572+02	-1.921+01	7.574+02	-1.453+00	6.047+02	6.955-01	.7895	.7238	3.403-01
8	4.096+00	-5.526-01	7.549+02	-1.344+01	7.551+02	-1.020+00	6.047+02	6.931-01	.7895	.7254	3.860-01
9	4.096+00	-3.316-01	7.534+02	-7.956+00	7.535+02	-6.050-01	6.047+02	6.915-01	.7895	.7264	4.317-01
10	4.096+00	-1.105-01	7.527+02	-2.636+00	7.527+02	-2.007-01	6.047+02	6.907-01	.7895	.7269	4.772-01
11	4.096+00	1.105-01	7.527+02	2.636+00	7.527+02	2.007-01	6.047+02	6.907-01	.7895	.7269	5.228-01
12	4.096+00	3.316-01	7.534+02	7.956+00	7.535+02	6.050-01	6.047+02	6.915-01	.7895	.7264	5.683-01
13	4.096+00	5.526-01	7.549+02	1.344+01	7.551+02	1.020+00	6.047+02	6.931-01	.7895	.7254	6.140-01
14	4.096+00	7.737-01	7.572+02	1.921+01	7.574+02	1.453+00	6.047+02	6.955-01	.7895	.7238	6.597-01
15	4.096+00	9.947-01	7.601+02	2.536+01	7.606+02	1.911+00	6.047+02	6.986-01	.7895	.7218	7.056-01
16	4.096+00	1.216+00	7.637+02	3.200+01	7.644+02	2.399+00	6.047+02	7.025-01	.7895	.7193	7.517-01
17	4.096+00	1.437+00	7.678+02	3.921+01	7.688+02	2.924+00	6.047+02	7.069-01	.7895	.7165	7.980-01
18	4.096+00	1.658+00	7.723+02	4.707+01	7.737+02	3.488+00	6.047+02	7.119-01	.7895	.7132	8.446-01
19	4.096+00	1.879+00	7.772+02	5.562+01	7.792+02	4.094+00	6.047+02	7.175-01	.7895	.7096	8.915-01
20	4.096+00	2.100+00	7.824+02	6.492+01	7.851+02	4.744+00	6.047+02	7.235-01	.7895	.7058	9.387-01
	4.096+00	2.385+00	7.898+02	7.814+01	7.937+02	5.650+00	6.047+02	7.323-01	.7895	.7001	1.000+00

RAKE NUMBER 6

I	X	Y	VX	VY	VRE	THETA	VBL	MACH	RB/RT	PS/PT	WFRACT
	1.201+01	-3.287+00	4.706+02	-1.756+00	4.736+02	-2.139-01	4.388+02	4.198-01	.9137	.8858	0.000
1	1.201+01	-3.100+00	4.635+02	-5.551+00	4.636+02	-6.850-01	4.388+02	4.134-01	.9137	.8890	2.772-02
2	1.201+01	-2.774+00	4.691+02	-7.758+00	4.692+02	-9.475-01	4.388+02	4.185-01	.9137	.8865	7.610-02
3	1.201+01	-2.447+00	4.732+02	-8.586+00	4.733+02	-1.039+00	4.388+02	4.223-01	.9137	.8845	1.250-01
4	1.201+01	-2.121+00	4.766+02	-8.533+00	4.767+02	-1.026+00	4.388+02	4.255-01	.9137	.8830	1.743-01
5	1.201+01	-1.795+00	4.794+02	-7.950+00	4.795+02	-9.500-01	4.388+02	4.280-01	.9137	.8816	2.239-01
6	1.201+01	-1.468+00	4.817+02	-6.988+00	4.818+02	-8.311-01	4.388+02	4.301-01	.9137	.8806	2.737-01
7	1.201+01	-1.142+00	4.835+02	-5.683+00	4.835+02	-6.734-01	4.388+02	4.318-01	.9137	.8798	3.238-01
8	1.201+01	-8.158-01	4.848+02	-4.198+00	4.848+02	-4.962-01	4.388+02	4.330-01	.9137	.8791	3.740-01
9	1.201+01	-4.895-01	4.856+02	-2.577+00	4.856+02	-3.041-01	4.388+02	4.337-01	.9137	.8787	4.244-01
10	1.201+01	-1.632-01	4.861+02	-8.789-01	4.861+02	-1.036-01	4.388+02	4.341-01	.9137	.8785	4.748-01
11	1.201+01	1.632-01	4.861+02	8.785-01	4.861+02	1.035-01	4.388+02	4.341-01	.9137	.8785	5.252-01
12	1.201+01	4.895-01	4.856+02	2.577+00	4.856+02	3.040-01	4.388+02	4.337-01	.9137	.8787	5.756-01
13	1.201+01	8.158-01	4.848+02	4.198+00	4.848+02	4.961-01	4.388+02	4.330-01	.9137	.8791	6.260-01
14	1.201+01	1.142+00	4.835+02	5.682+00	4.835+02	6.734-01	4.388+02	4.318-01	.9137	.8798	6.762-01
15	1.201+01	1.468+00	4.817+02	6.988+00	4.818+02	8.311-01	4.388+02	4.301-01	.9137	.8806	7.263-01

16	1.201+01	1.795+00	4.794+02	7.949+00	4.795+02	9.499-01	4.388+02	4.280-01	.9137	.8816	7.761-01
17	1.201+01	2.121+00	4.756+02	8.532+00	4.767+02	1.026+00	4.388+02	4.255-01	.9137	.8830	8.257-01
18	1.201+01	2.447+00	4.732+02	8.585+00	4.733+02	1.039+00	4.388+02	4.223-01	.9137	.8845	8.750-01
19	1.201+01	2.774+00	4.691+02	7.758+00	4.692+02	9.475-01	4.388+02	4.185-01	.9137	.8865	9.239-01
20	1.201+01	3.100+00	4.635+02	5.550+00	4.636+02	6.950-01	4.388+02	4.134-01	.9137	.8890	9.723-01
	1.201+01	3.287+00	4.736+02	1.756+00	4.736+02	2.139-01	4.388+02	4.198-01	.9137	.8858	1.000+00

RAKE WEIGHT FLOW DATA

I	K	IRAK	WDOT	WDOTCA	MACH
1	-1.0000	1	1.53738+01	1.94614+01	2.35601-01
2	-.5000	1	1.61647+01	2.04626+01	2.48653-01
3	1.0000	3	1.71770+01	4.46710+01	6.84418-01
4	2.0960	3	1.70888+01	4.74519+01	7.92717-01
5	4.0960	3	1.70588+01	4.52721+01	7.04050-01
6	12.0090	3	1.69936+01	3.27263+01	4.25691-01

aPMO,E

aFIN

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REFERENCES

1. Stockman, Norbert O.; and Farrell, Charles A. Jr.: Computer Programs for Calculating Potential Flow in Propulsion System Inlets. NASA TM-73728, 1977.

2. Hess, J. L.; and Smith, Apollo M. O.: Calculations of Potential Flow about Arbitrary Bodies. Progress in Aeronautical Sciences, Vol. 8, D. Kuchemann, ed.; Pergaman Press, 1967, pp. 1-138.

3. Lieblein, Seymour; and Stockman, Norbert O.: Compressibility Correction for Internal Flow Solutions. J. Aircraft, Vol. 9, No. 4, April 1972, pp. 312-314.

TABLE I. - BISUPERELLIPSE INPUT OPTIONS

[To fit [illegible], $(X/A)^P + (Y/B)^Q = 1$, between two given points (XIN(2), YIN(2)) and (XIN(4), YIN(4)), tangent (except case f) to the specified endlines (lines 1 - 2 and 4 - 5),[a] and [illegible] listed conditions, set the input as indicated. (Do not input P, Q, or N as 1.0.)]

Figure 11	Given [illegible]	Input the [illegible]					
		REEDEN (1)	REEDEN (2)	XIN(3)	YIN(3)	XIN(6)	YIN(6)
a	One point (X_3, Y_3) (Superellipse)			X_3	Y_3		
b	One exponent, N (P = Q = N) (Superellipse)	N	N				
b	Two exponents, P and Q[d]	P	Q				
c	One exponent P and one point (X_3, Y_3)[d]	P		X_3	Y_3		
c	One exponent Q and one point (X_3, Y_3)[d]		Q	X_3	Y_3		
d	Two points (X_3, Y_3) and (X_6, Y_6)			X_3	Y_3	X_6	Y_6
e	One point (X_3, Y_3) and its slope [illegible]			X_3	Y_3	[illegible]	-100.
f	X-location of inflection point X_3 and its slope $(dy/dx)_3$[b]			X_3	+100.	$(dy/dx)_3$	-100.
g	Curvature CAP at an endpoint (X_E, Y_E) where (X_E, Y_E) may be either (XIN(2), YIN(2)) or (XIN(4), YIB(4))[c]			X_E	Y_E	CAP	200.
h	Curvature at end point (XIN(2), YIN(2)) is to be set equal to curvature at last point of previous segment[c]			XIN(2)	YIN(2)	999.	200.

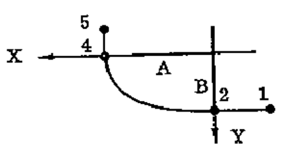
[a]In general, lines 1 - 2 and 4 - 5 need not be [illegible] (fig. 6). If they are not, the bisuperellipse equation is $\left(\frac{X' + Y' \tan w}{A}\right)^P + \left(\frac{Y'}{B}\right)^Q = 1$, where $Y' = Y$ and $X' = X + Y \tan w$ and w is the angle of deviation from [illegible]. The angle w may be positive or negative depending on whether the angle β (fig. 6(a)) between lines 1 - 2 and 4 - 5 is acute or obtuse, ($w = 90 - \beta$).

[b]For this option: (1) no shear [illegible] is allowed, i.e., the endlines 1 - 2 and 4 - 5 must be [illegible] (2) one endline must be [illegible] (3) only one endline is tangent to the curve; the other endline is orthogonal to the curve. See figure 7(f) for detailed restrictions. In general, a bisuperellipse will have an inflection if either P or Q is less than 1 and the other is greater than 1.

[c]For curvature options: (1) no shear [illegible], are allowed; (2) desired curvature, whether via input CAP (g) or previous segment (h), cannot be zero or infinite; (3) for curvature matching option (h) the slope angle at the curvature match endpoint cannot be 90° unless the previous segment is also a bisuperellipse.

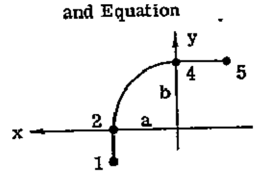
[d]A problem can arise in [illegible] bisuperellipse exponents P and/or Q. The standard SCIRCL orientation is that of a typical inlet internal lip as shown in the sketch.

Standard SCIRCL [illegible]



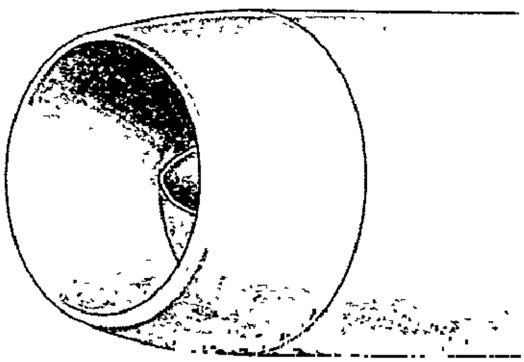
$$\left(\frac{X}{A}\right)^P + \left(\frac{Y}{B}\right)^Q = 1$$

Typical User Orientation and Equation

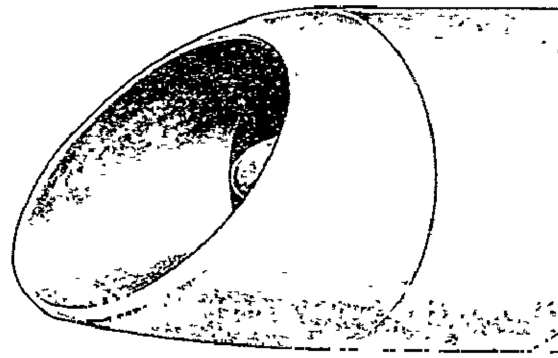


$$\left(\frac{x}{a}\right)^p + \left(\frac{y}{b}\right)^q = 1$$

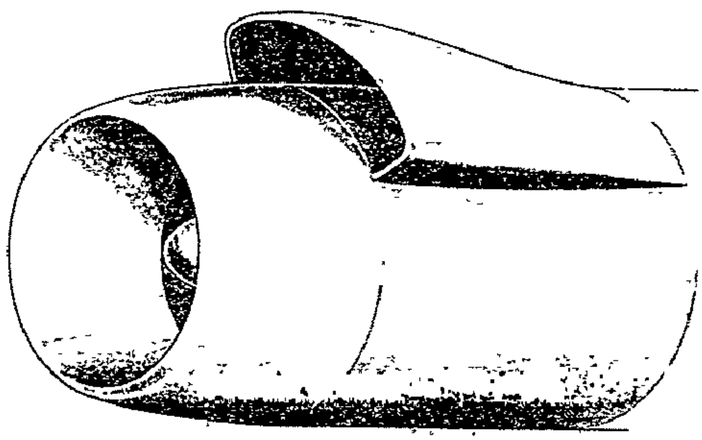
The user's orientation is arbitrary and if different from the standard orientation will be transformed to the standard within SCIRCL by rotation and/or mirroring. For some user orientations the transformations will result in an interchange of exponents [illegible] P = q and Q = p. Since the curvature at point 2 is controlled largely by P and at point 4 by Q, the user must input p as Q and q as P to get the desired curvature [illegible] (Whenever P = q and Q = p then X = y and Y = x and A = b and B = a; however, A and B as such are not input but the output will reflect this interchange.)
The important factor in determining the relationship between P, Q and p, q is the angle of rotation required to bring the user's line 1-2 to a horizontal position. If that angle is an odd multiple of 90° then P = q and Q = p. If the angle is an even multiple of 90° then P = p and Q = a and there is no problem.



(a) Variable contraction ratio.



(b) Scoop inlet.



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(c) Dual inlet.

Figure 1. - Sample V/STOL three dimensional inlets.

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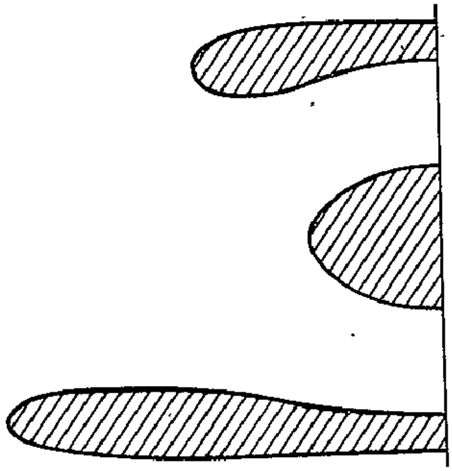
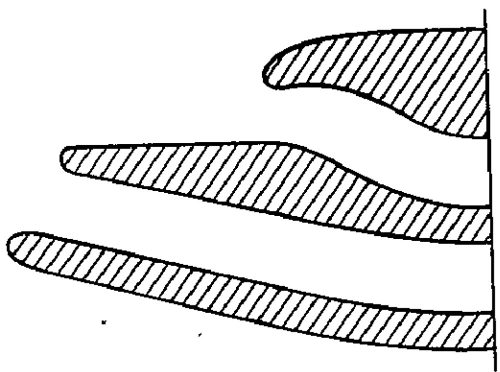


(a) Scoop inlet.



(b) Dual inlet.

Figure 2. - Two-dimensional approximations.

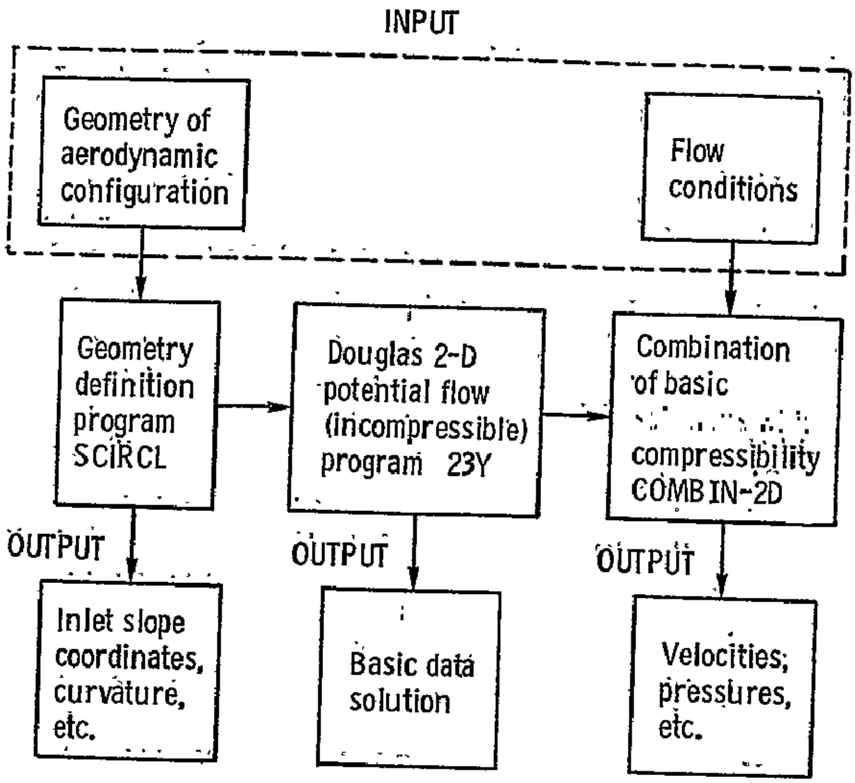
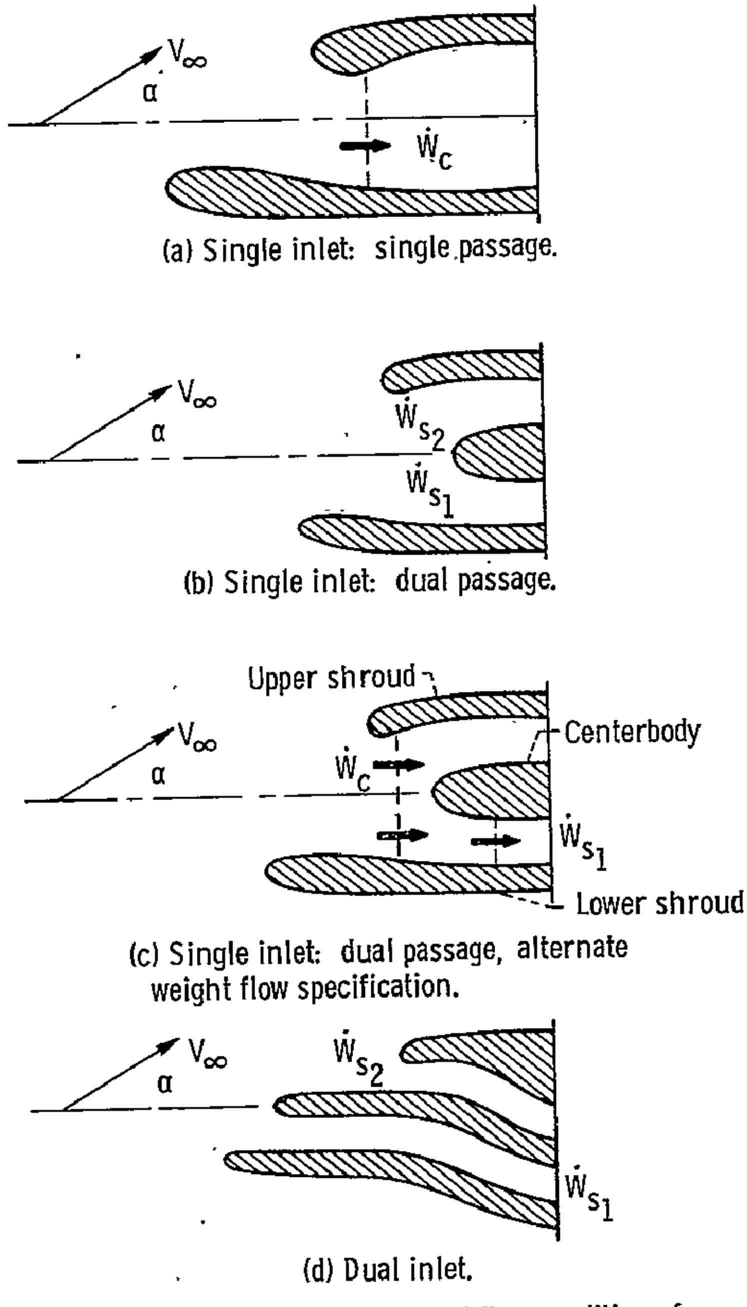


Figure 3. - Schematic of overall programs.



(a) Single inlet: single passage.

(b) Single inlet: dual passage.

(c) Single inlet: dual passage, alternate weight flow specification.

(d) Dual inlet.

Figure 4. - Inlet geometries and flow conditions for combined solution: inlet mass flow rate, $\dot{W}$; free stream velocity, V_∞; and inlet incidence angle, α.

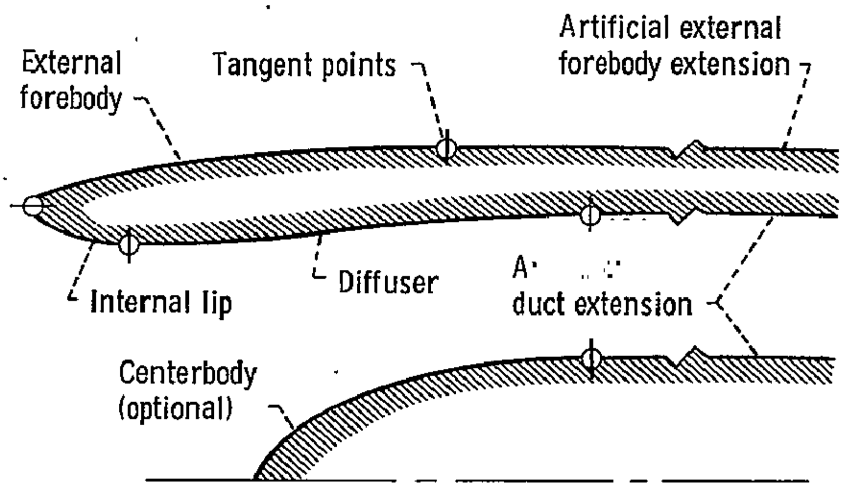


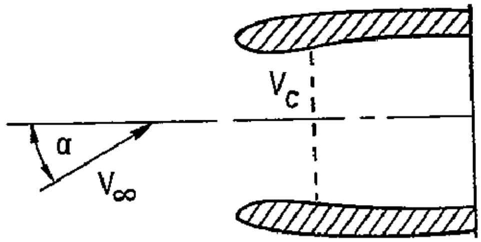
Figure 5. - Typical inlet segmentation.

At any point

$$\overline{V} = A\overline{V}_1 + B\overline{V}_2 + C(\overline{V}_3 - \overline{V}_4)$$

where A, B, and C are determined by specifying values of:

- V_c average axial velocities at the control station
- V_∞ free stream velocity
- α direction of free stream velocity relative to inlet axis



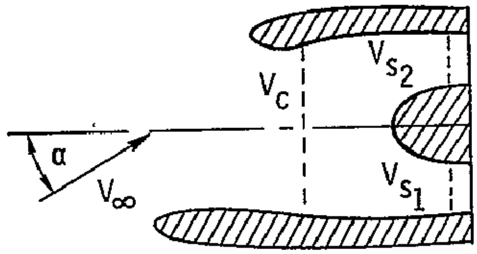
(a) Single passage inlet.

At any point

$$\overline{V} = A\overline{V}_1 + B\overline{V}_2 + C(\overline{V}_3 - \overline{V}_4) + D(\overline{V}_5 - \overline{V}_4)$$

where A, B, C, and D are determined by specifying values of:

- V_c, V_{s_1}, V_{s_2} average axial velocities at any two of the three control stations
- V_∞ free stream velocity
- α direction of free stream velocity relative to inlet axis



(b) Two passage inlet.

Figure 6. - Combined solution, $\overline{V}$.

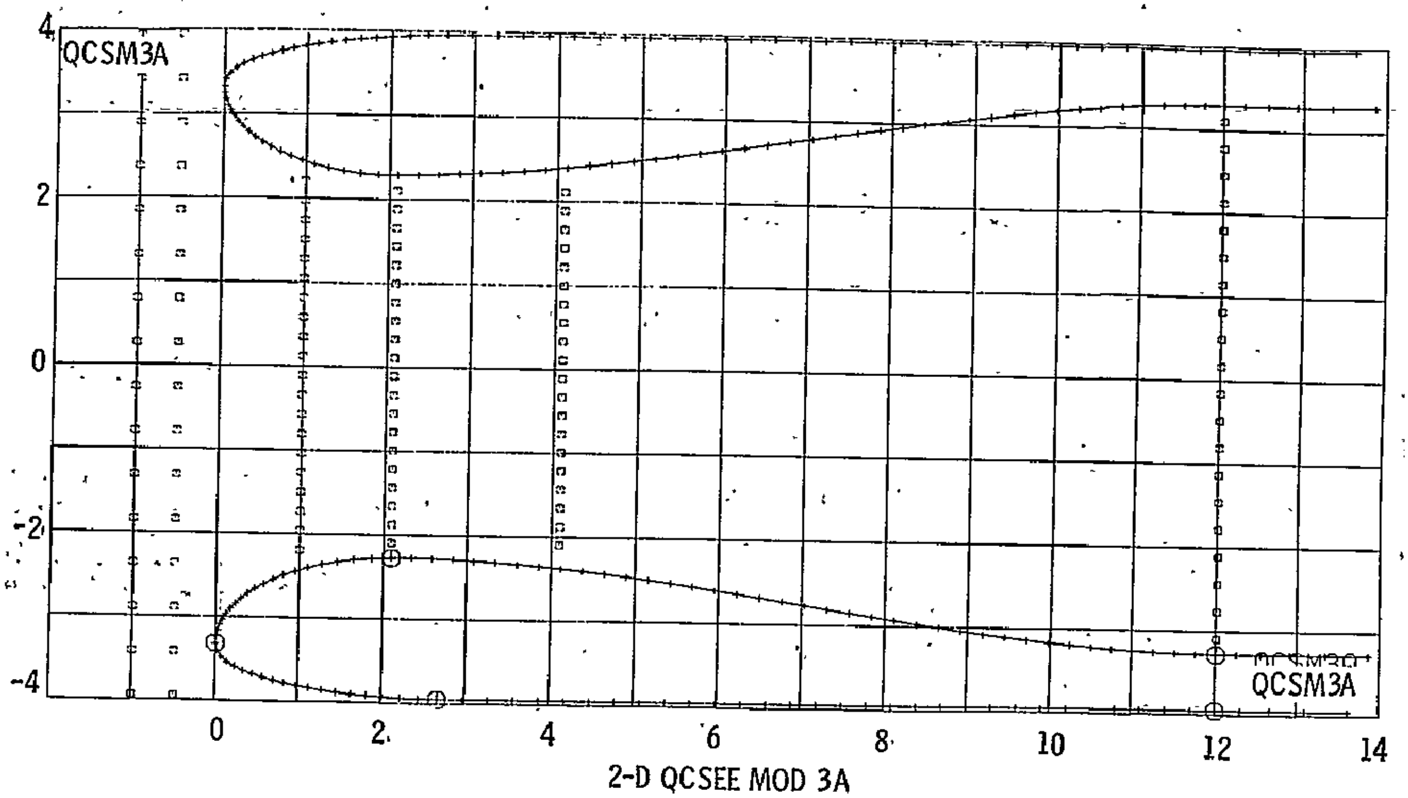


Figure 7. - Graphic output from program SCIRCL.

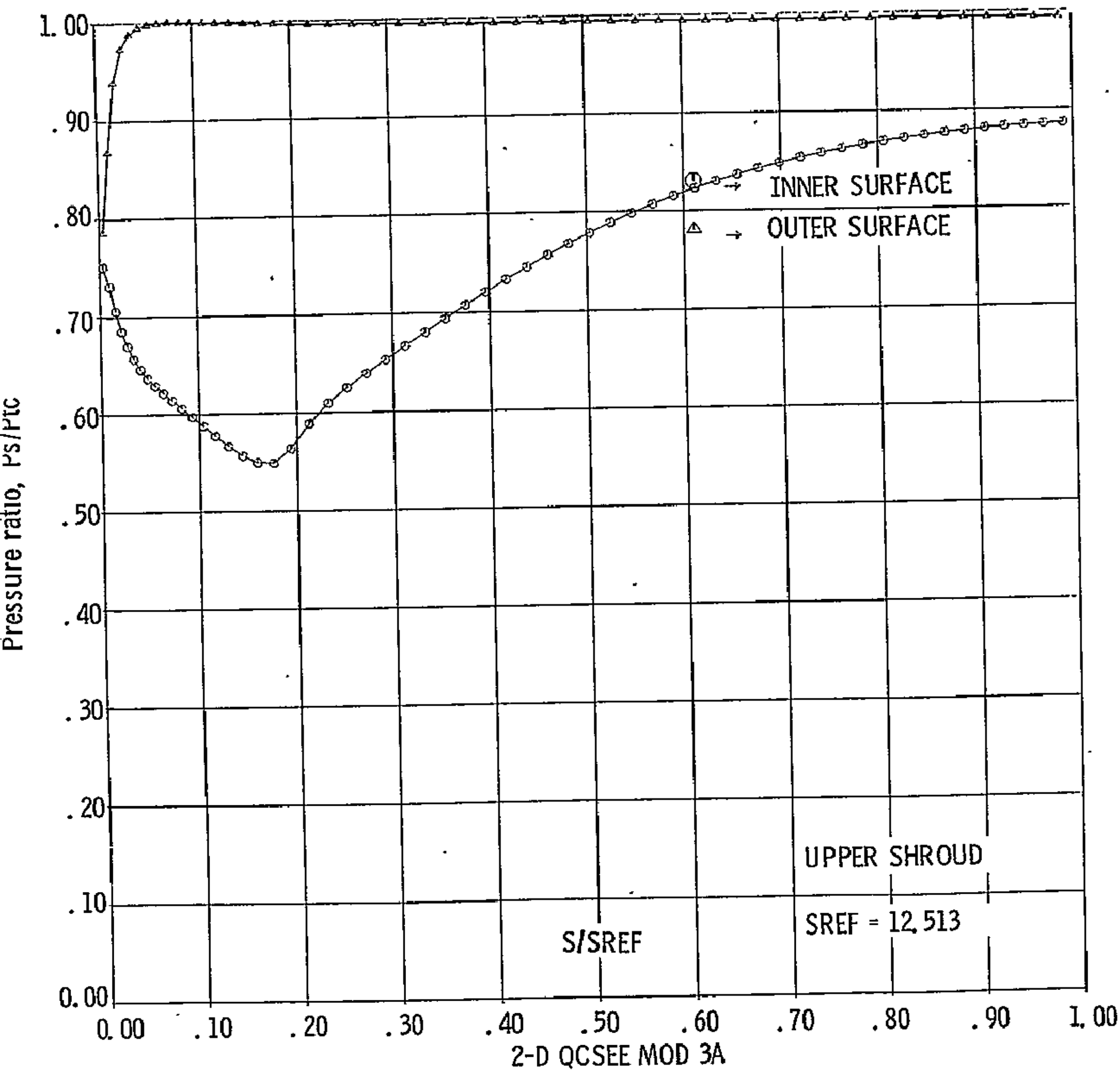


Figure 8. - Surface static pressure ratio from program COMBIN-2D.

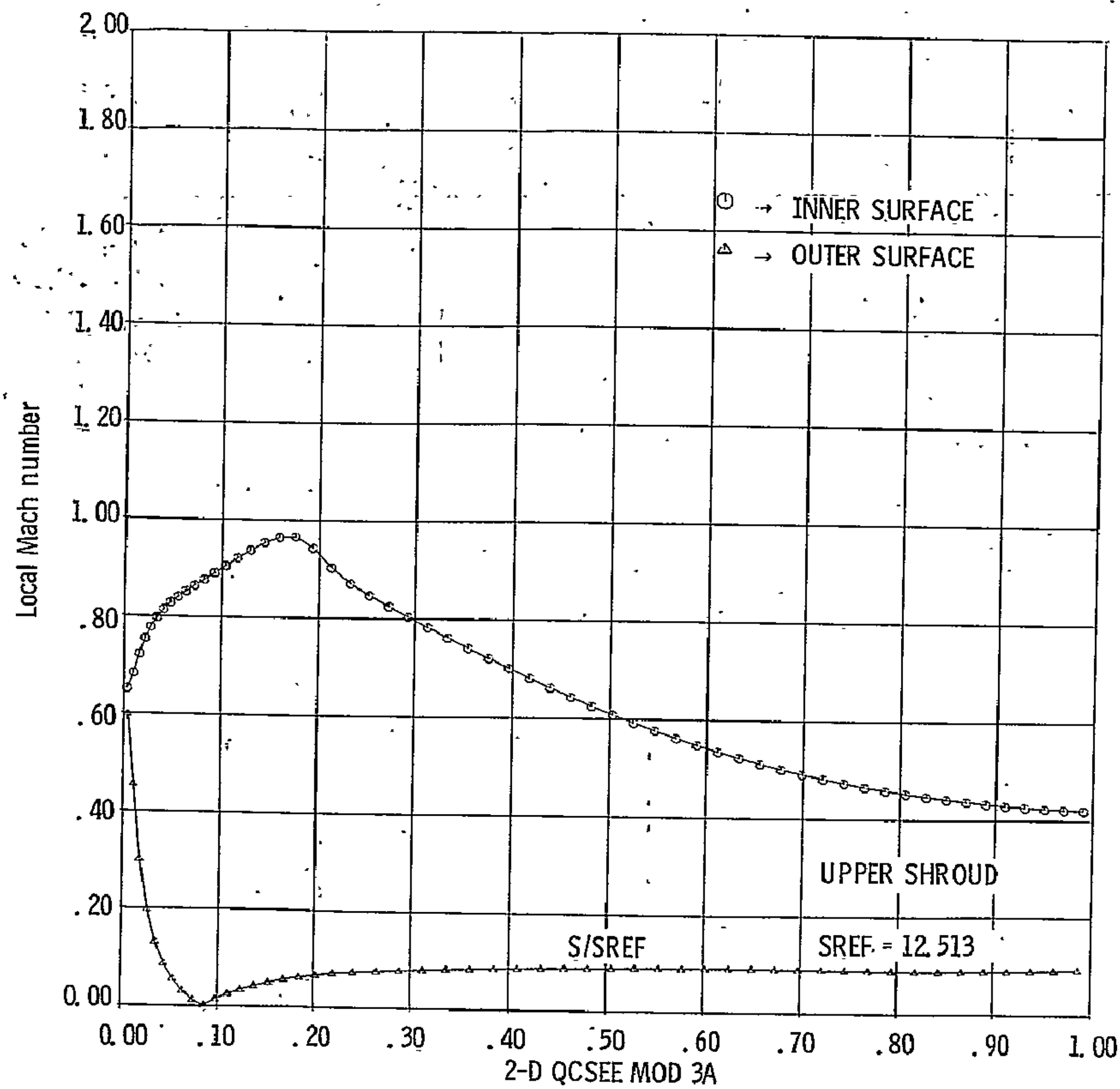


Figure 9. - Surface Mach number distribution from program COMBIN-2D.

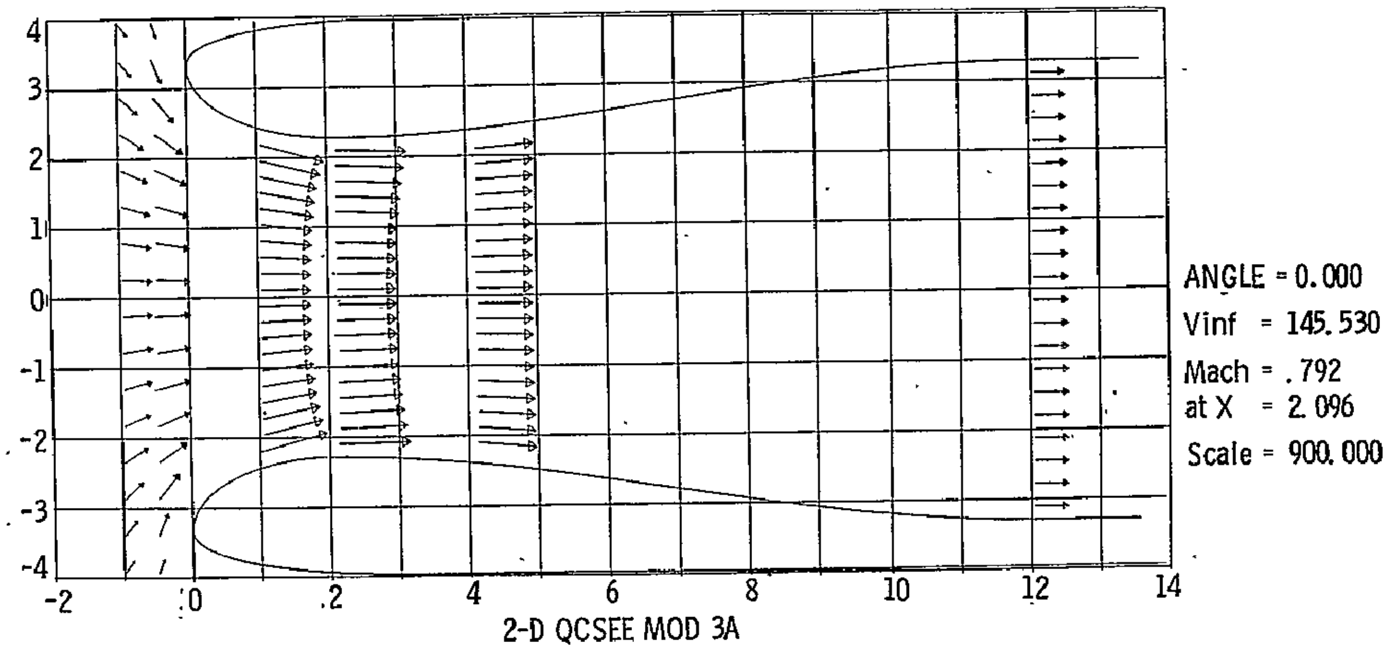
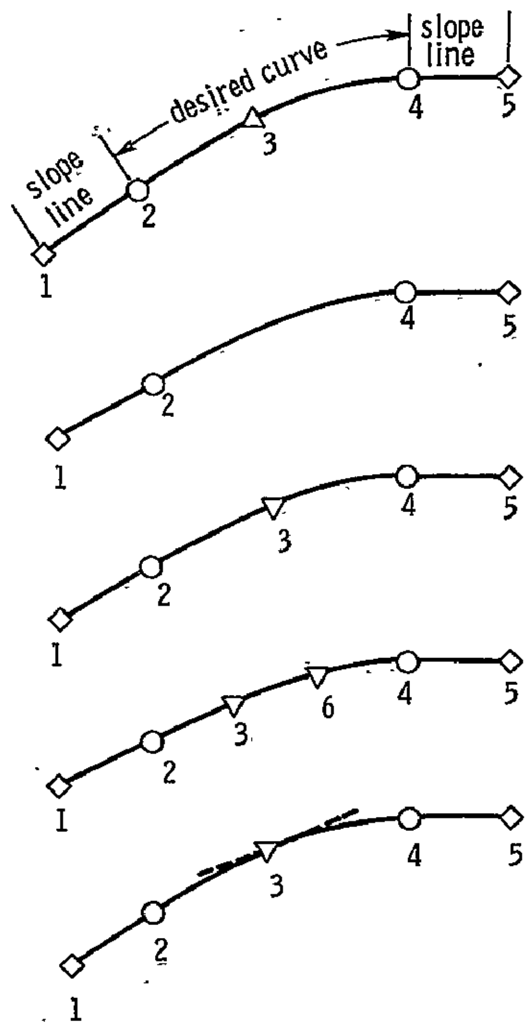


Figure 10. - Vector flow field from program COMBIN-2D.

○ Segment endpoints
◇ Slope line endpoints (length of slope line is arbitrary)
△ Optional superellipse point
▽ Optional bisuperellipse point
◺ Optional bisuperellipse inflection point



(a) Superellipse optional point (X_3, Y_3) specified. Exponent N calculated.

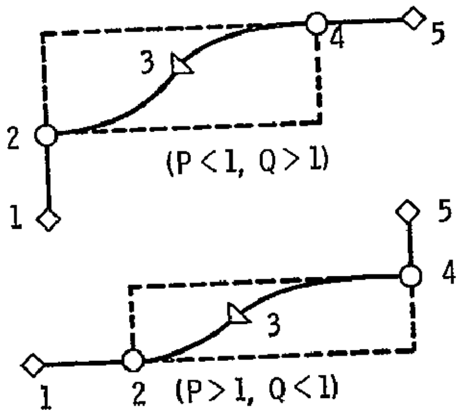
(b) Superellipse exponent N or bisuperellipse exponents P and Q specified.

(c) Optional point (X_3, Y_3) and exponent P or Q specified. Exponent Q or P respectively calculated.

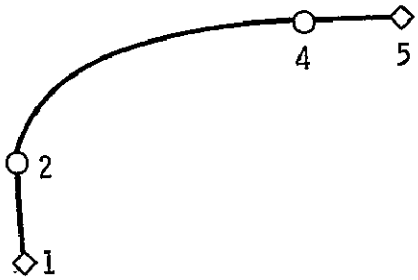
(d) Optional points (X_3, Y_3) and (X_6, Y_6) specified. Exponents P and Q calculated.

(e) Optional point (X_3, Y_3) and slope $(dy/dx)_3$. Exponents P and Q calculated.

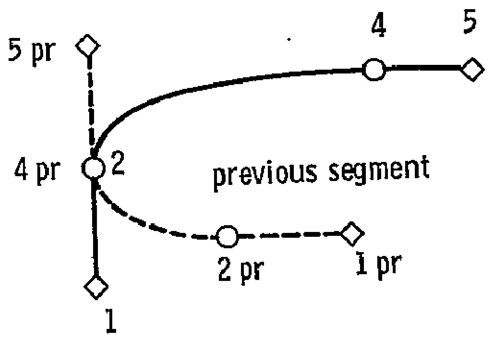
Figure 11. - Sketches for SCIRCL input. Bisuperellipse options.



(f) Bisuperellipse with inflection point. Axial location X_3 and slope $(dy/dx)_3$ of inflection point specified. Note that the slope line requirements for this option are different from all other options. One slope line must be perpendicular to curve and one must be tangent, thus there are two possibilities as shown. Both lines must lie away from and outside the 'box' surrounding the desired curve. Also, shown are the exponents that will result in each case.



(g) Curvature at either point 2 or point 4 specified.



(h) Curvature at endpoint 2 matched to internally calculated curvature at endpoint 4 pr of previous segment.

Figure 11. - Concluded.

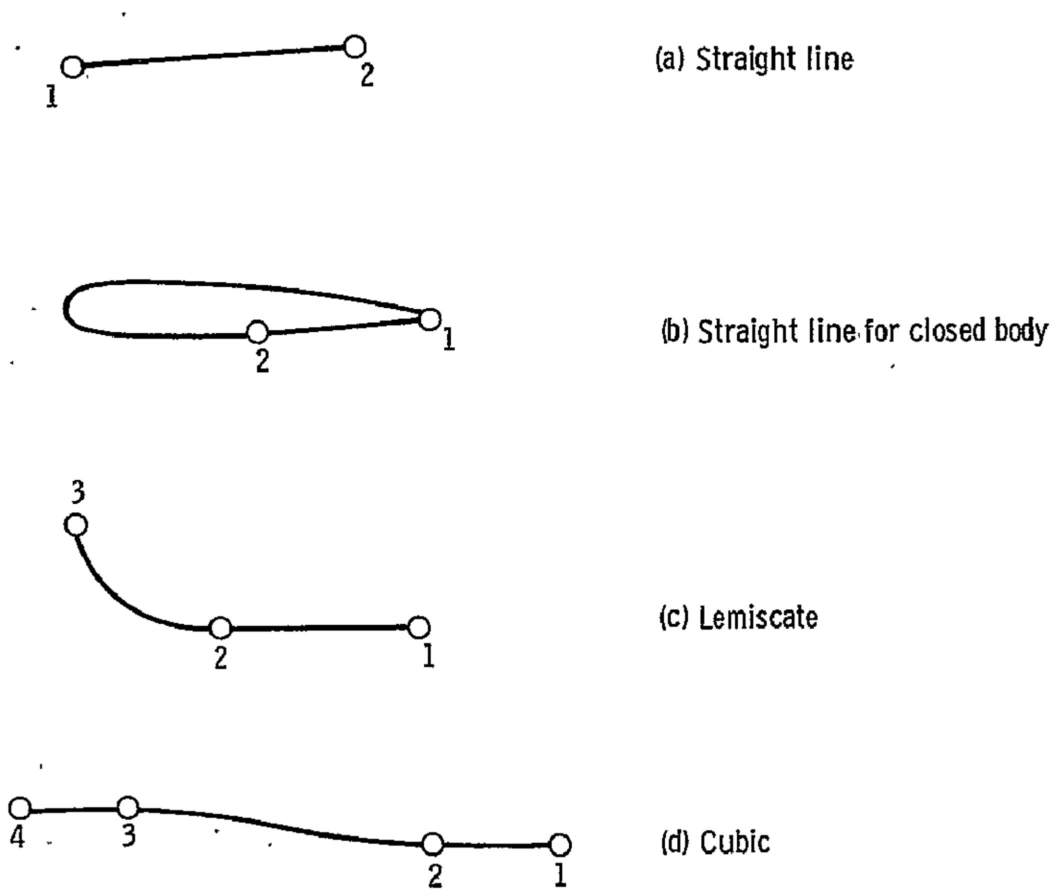
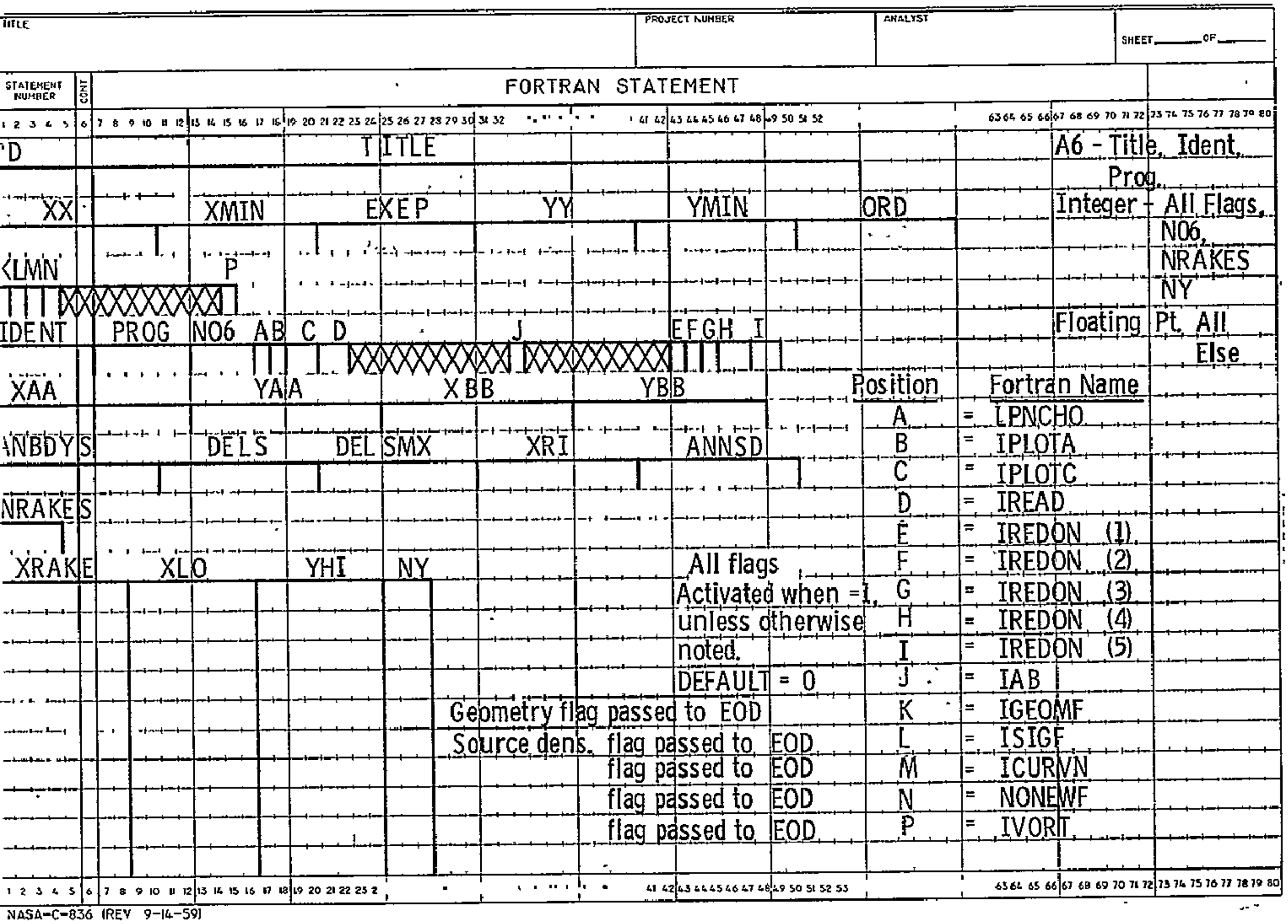


Figure 12. - Sketches for SCIRCL input options except bisuperellipse.



(a) Title, control and rake data cards.

Figure 13. - SCIRCL input layout.

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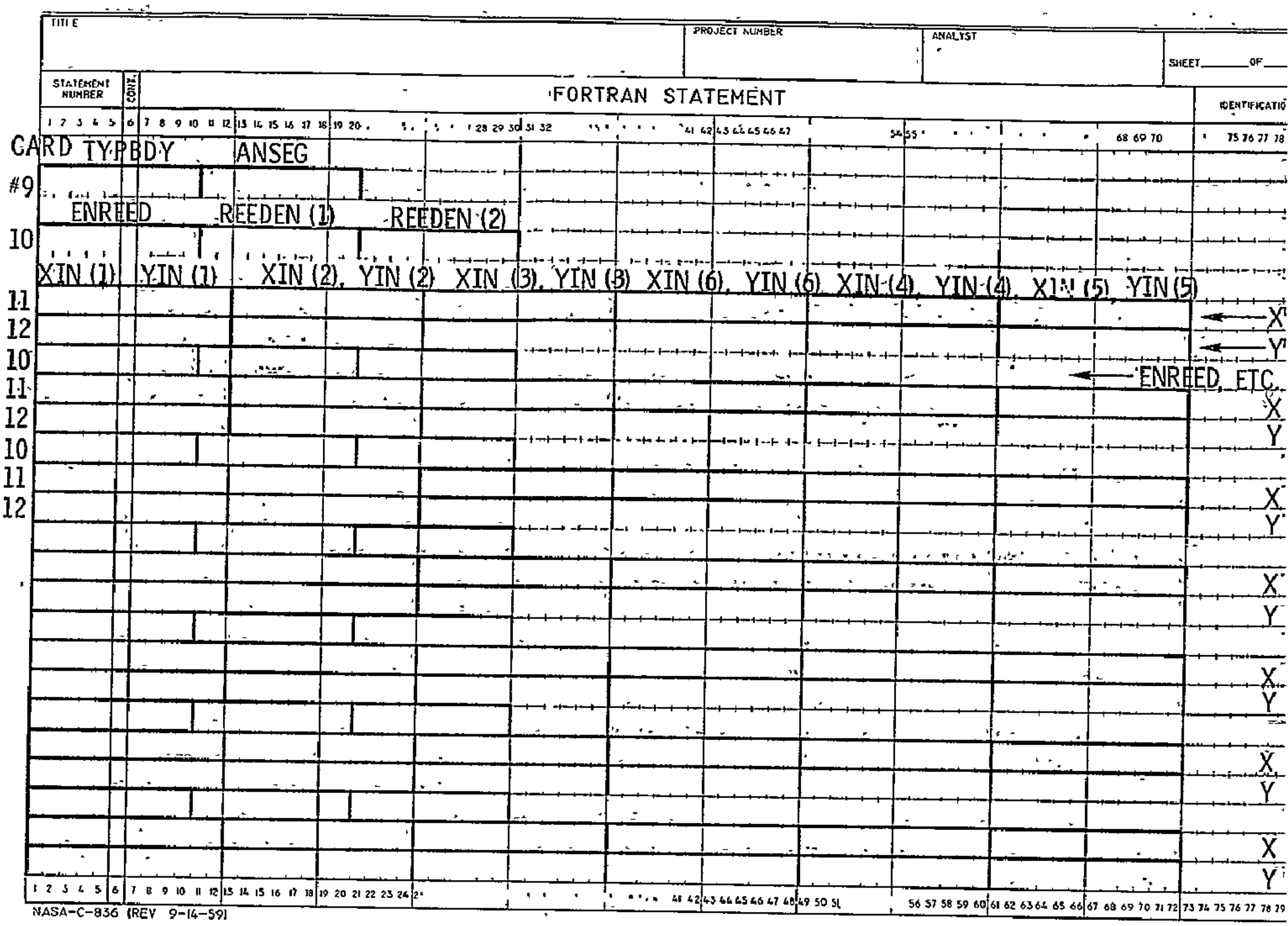

(b) Body and segment data cards.

Figure 13. - Concluded.

PROJECT NUMBER | ANALYST | SHEET ____ OF ____

FORTRAN STATEMENT | IDENTIFICATION

```
TITLE
NT  NSI NH  NP  IW  NX  KND ICOMP. IHUB
VC   VS1   VS2   VINF   ALFA   MC   MC1   MC2   TTOTAL   PT
ELND  WDOTC  WDOTC1  WDOTC2  PSTAT  TSTAT  CUTOF1  CUTOF2  CUTOFH  VPERIN*
* INSERT CARD 4A ONLY IF VPERIN ≥ 0 SEE SCIRCL INPUT CARD #2 FOR LAYOUT
XTEST   YCL   YCU
XTEST1  YCL1  YCU1
XTEST2  YCL2  YCU2
XR1   XR2   XRH
YR1   YR2   YRH
```

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Figure 14. - COMBIN-2D input form.

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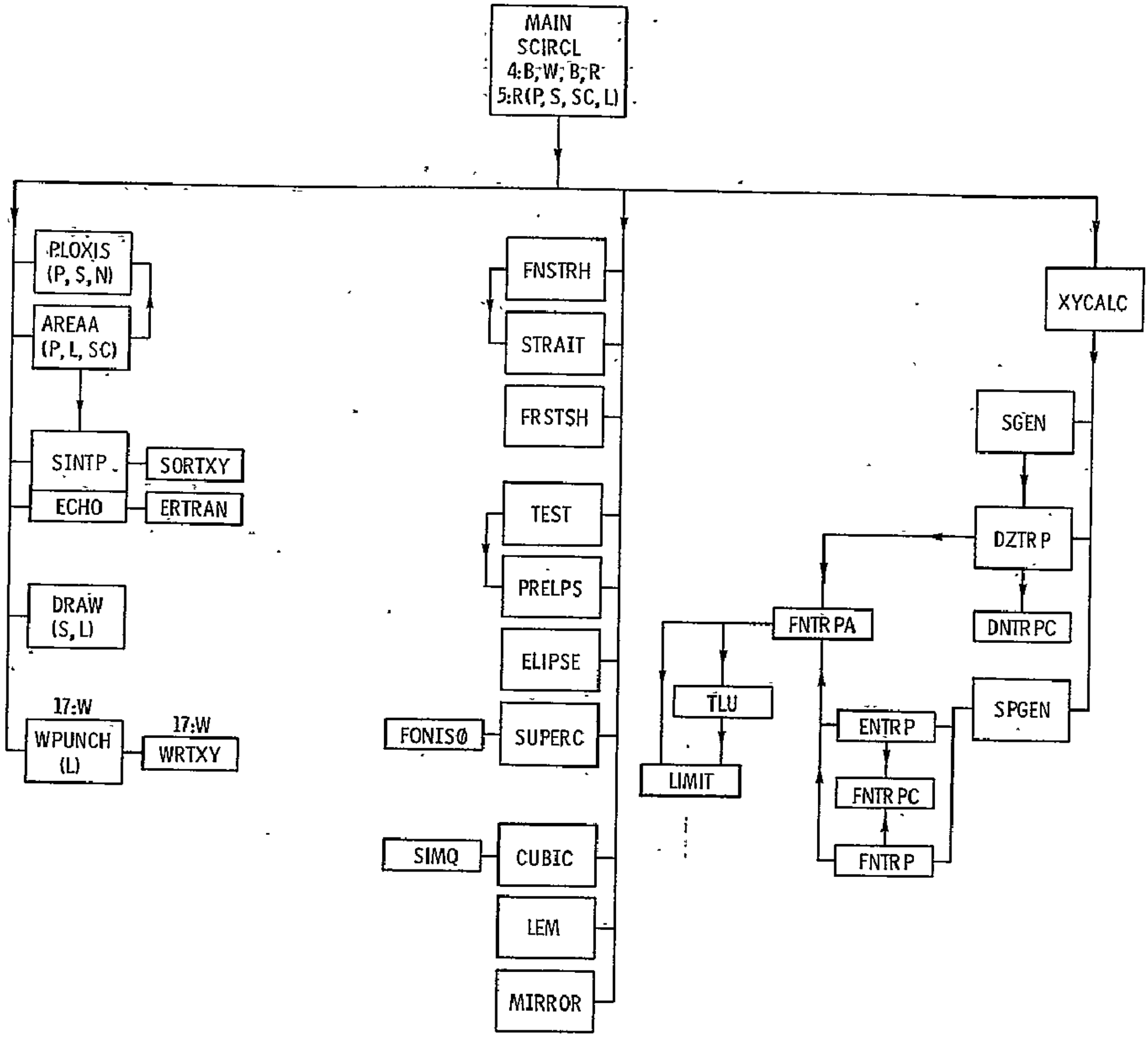


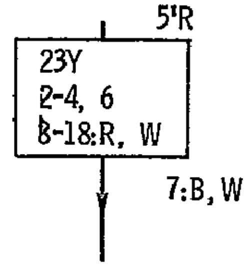
(a) SCIRCL.

Calcomp Routines Referenced:

5 - I/O Unit No.
B - Rewind
W - Write
R - Read

(L) - Line
(P) - Plot
(S) - Symbol
(SC) - Scale
(N) - Number

Figure 15.- Call Sequences.



(b) 23Y.

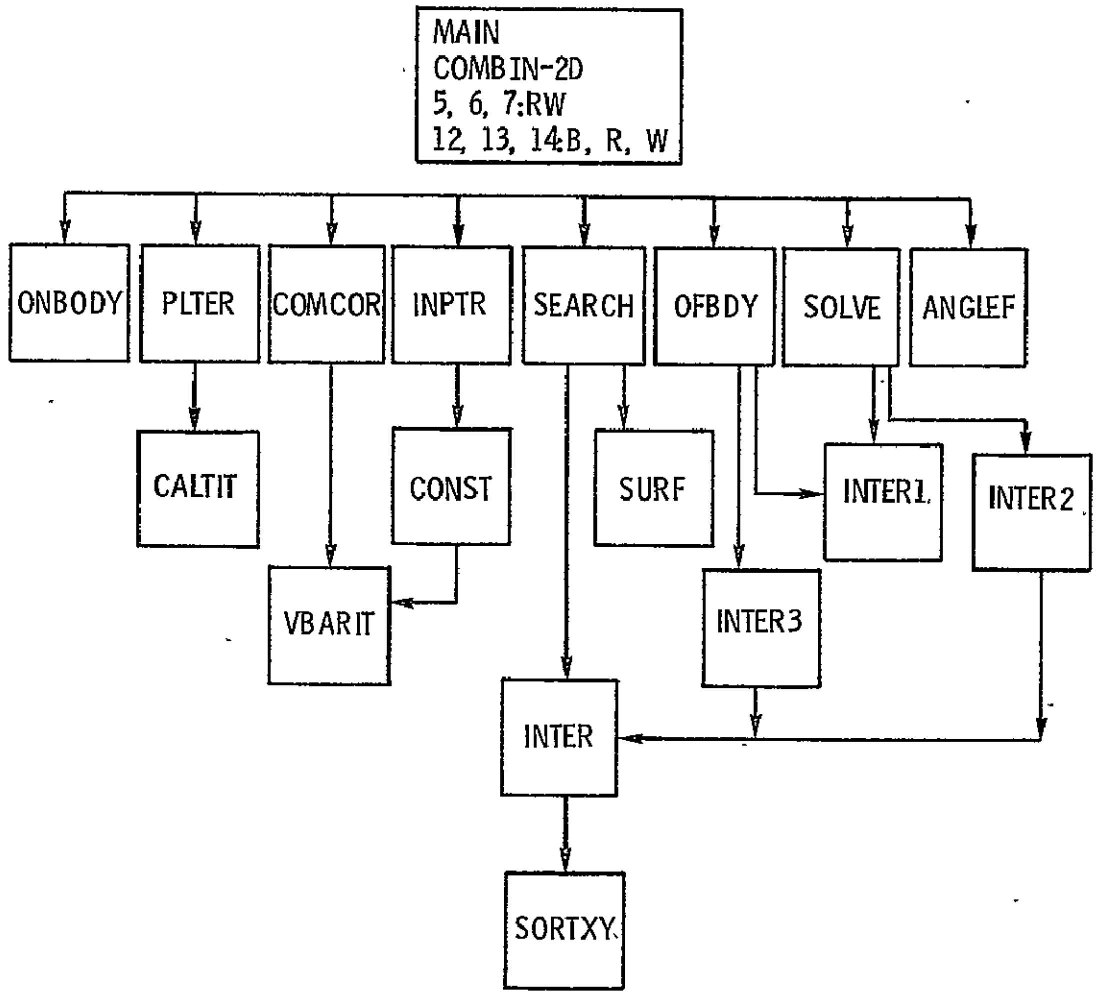


Figure 15. - Concluded.

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		6. Performing Organization Code
7. Author(s) J. Dennis Hawk, Norbert O. Stockman, and Charles A. Farrell, Jr.		8. Performing Organization Report No E-9671
9 Performing Organization Name and Address National Aeronautics and Space Administration Lewis Research Center Cleveland, Ohio 44135		10 Work Unit No
		11 Contract or Grant No
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12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D.C. 20546		14 Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

Computer programs to calculate the incompressible potential flow, corrected for compressibility, in two-dimensional inlets at arbitrary operating conditions are presented. Included are a statement of the problem to be solved, a description of each of the computer programs, and sufficient documentation, including a test case, to enable a user to run the program.

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